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THE UNIVERSITY OF ALBERTA

UTILIZATION OF ACUTE CARE HOSPITAL SERVICES BY RESIDENTS OF THE WETASKIWIN HOSPITAL DISTRICT

BY

© TERRANCE B. CLAYTON

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
AND RESEARCH IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
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AND COMMUNITY MEDICINE

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FALL, 1988

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled UTILIZATION OF ACUTE CARE HOSPITAL SERVICES BY RESIDENTS OF THE WETASKIWIN HOSPITAL DISTRICT submitted by Terrance B. Clayton in partial fulfilment of the requirements for the degree of Master of Health Services Administration.

Kyung Bay
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Date: June 1, 1988

ABSTRACT

The primary purpose of this study was to examine the patterns of acute care hospital utilization by the residents of a rural hospital district, and to compare the utilization rates with corresponding provincial rates.

The Wetaskiwin General Hospital District (81) was selected for study; it includes four Indian reserves around Hobbema. An exploratory and descriptive research strategy was employed, using all separation abstracts for residents from 1971 to 1984/85. The study objectives included determination of patient-flow patterns into and out of the hospital district, identifying differences in native and non-native utilization rates and determination of certain diagnosis-specific and procedure-specific rates.

Major findings of this study include:

1) District residents increased their dependence on acute care hospitals other than the local facility over the study period. Separations from Edmonton, and border area hospitals, ranged from 12% to 16%, and from 7% to 15%, respectively. The local hospital's market share of the district population decreased from 79% to 67%.

2) The Wetaskiwin General Hospital increased its commitment to district residents over the study period. From 1976 to 1984/85, 88-92% of its patients were from the local district.

3) Per capita separation rates for residents of the Wetaskiwin Hospital District were 19% to 107% higher than corresponding provincial rates. Patient-day rates exhibited a similar trend.

4) Per capita separation rates for natives were 2.6 to 3.2 times the non-natives rate. Similar results were found for patient-day rates. Per capita

analysis by band indicated that the Louis Bull Band had the highest utilization rates and the Montana Band had the lowest rates.

5) District 81 residents had maximum per capita separation rates for upper respiratory infections and pneumonia that were 4.9 and 6.5 times, respectively, the corresponding provincial rates. They also had substantially higher separation rates for tonsillectomies.

The major conclusions from this study were that rural hospital administrators should estimate market shares from both a district and hospital perspective on an annual basis. Disease-specific and procedure-specific rates for the most frequently occurring categories can be analyzed annually on a per capita basis, and rates for less frequently occurring categories can be determined using a moving average.

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CHAPTER I
INTRODUCTION

In the current era of fiscal restraint, planning for the optimal allocation and utilization of health care resources is one of the most critical tasks facing decision makers. Hospital administrators and planners are constantly faced with the challenge of determining which services to provide, where to provide them, and at what service intensity level. Decreases in government funding put a premium on the administrator's ability to provide required services while operating within the hospital's budget. One area of particular concern is in non-urban hospital districts, where resources and expertise for determining utilization beyond simple rate statistics often are not available. Pertinent utilization information can be crucial in the planning process to ensure that rational decisions are made in the allocation of resources. Accordingly, one focus of this study is on determining which methods are appropriate for non-urban hospital administrators and planners to identify utilization patterns and trends, for better planning purposes.

1.1 Statement of the Problem

One major problem facing the rural hospital administrator attempting to determine appropriate service levels is the lack of relevant and comparable information. The Department of Hospitals and Medical Care has published utilization data (Alberta Hospital Utilization Committee, 1981), but the information available is generally at the regional or provincial level and only cursory data are provided at the district level. There have been some academic studies of hospital utilization on a province-wide basis (e.g., Toll, 1982), of a particular service on a province-wide basis (e.g., MacDonald,

1983), and of a particular group's utilization across the province (e.g., Szafran, 1985). Nonetheless, analysis on a provincial or regional scale tends to obscure relevant information on hospital utilization differences in relatively small areas. Studies, such as those previously mentioned, are of substantial value to provincial planners but tend to be of limited value to a rural hospital administrator.

The hospital administrator essentially needs to address two fundamental questions. Firstly, who uses the hospital and for what purposes. From these data the administrator can determine the geographic market (where patients are coming from) and the product market (what patients are coming for). This information is collected upon separation and thus readily available.

Secondly, the question of where district residents go for inpatient care should be addressed. If the hospital board determines that too many district residents are obtaining services outside the district (when these same services are available at the district hospital), they will demand an explanation. Some services may be better provided at the local level with the possibility of causing less patient hardship. Administrators and planners need to know patient origins and destinations, and possible reasons for patient movement would be of value.

In an era where governments establish guidelines and require supporting documentation of unmet need before a service is established or equipment is purchased, the administrator must have information on recent changes in demographics and events, or epidemiological evidence of need and documentation of unsatisfactory care. Justification is also needed when authorities demand cutbacks in service intensity or personnel; hospitals that

can produce information on utilization will fair better than those that can not.

1.2 Study Objectives

The purposes of this study are to conduct longitudinal, exploratory, population-based analyses of utilization patterns of residents of a rural hospital district, and to analyze utilization at that district's acute care hospital. Specifically, the following research objectives have been formulated:

1) Determine the rates and trends in utilization of services at all acute care Alberta hospitals over the period 1971 to 1984/85 by residents of the Wetaskiwin General Hospital District;

2) Determine the rates and trends in utilization of services at a specific acute care hospital (i.e., Wetaskiwin General Hospital) over the period 1971 to 1984/85;

3) Describe patient flow patterns for the district;

4) Describe differences in utilization trends by natives and non-natives; and

5) Determine rates and trends in utilization for frequently occurring procedures and diagnostic categories.

The intent of this study is to determine who uses the Wetaskiwin General Hospital and for what purposes, identify where Wetaskiwin General Hospital District residents go for inpatient services, and to explore reasons why patients who left the district sought treatment elsewhere. The overall research goal is to gain further understanding of the hospital "selection" process by rural residents.

1.3 Significance of the Study

The majority of previous studies addressing Alberta hospital utilization have been global in nature, focusing on broad categories of subpopulations, services or programs, and various hospital classification schemes. In contrast, this thesis focuses on a single hospital district as its primary unit and investigates spatial movements into and out of that district. This unique perspective may be more pertinent to hospital administrators than studies conducted on a global basis.

Patient demands and needs are common concerns of hospital boards, administrators, and medical staffs across the province. Information can be obtained by asking administrators and physicians their perceptions of services needed by district patients. Boards can survey district residents to discover their demands for care. A more effective approach in interpreting the unmet demands of residents and in detecting unmet medical needs at the local hospital, however, may be to determine the extent of resident utilization outside the district, and identify which services residents utilized.

Explanations of spatial movement patterns by rural residents are found in the literature; however, from the administrator's perspective, the most enigmatic group are those that travel considerable distances to obtain services that were available at their local hospital. This group's activities are likely indicative of their perceptions of local hospital service. These perceptions are significant to the administrator from a professional perspective (i.e., service to the community) and a personal viewpoint (i.e., job tenure).

Although suggestions as to why residents of one district seek care in another district are available, there is little or no information on the extent of this movement. In most studies, the residents of one hospital district are

grouped with residents of another, making comparisons on a district basis irrelevant. Baseline data on the extent of out of district utilization by rural residents would be of value to rural administrators.

The findings of this study may contribute to planning for regional equipment purchases, new programs, or program expansions and/or enrichments.

1.4 Scope, Assumptions and Limitations of the Study

The overall scope of the study involves an exploratory, longitudinal, population-based analysis of patient care-seeking movements to and from Hospital District 81 (Wetaskiwin). The study is restricted to inpatients separated from the Wetaskiwin General Hospital (Hospital 114) and residents of District 81 who were inpatients at any Alberta hospital between January 1, 1971 to March 31, 1985. Due to the lack of appropriate data, it is deemed beyond the scope of the study to determine whether or not there were sufficient hospital beds in District 81 on any given date to satisfy the health needs of residents.

Certain research assumptions were implemented for this study.

1) For analytical purposes, utilization data were analyzed as if the province had a closed hospital system. Although data were available on out-of-province inpatients using the Wetaskiwin General Hospital, complementary data were not available on District 81 residents using out-of-province inpatient facilities. This necessitated restricting analysis to utilization by Alberta residents only. In both cases, it was assumed that non-residents and district residents seeking care outside the province would have a negligible effect.

2) Criteria for determining appropriate levels of care must be applied on an individual inpatient basis or by a professional review panel and are beyond the scope of this thesis. Therefore, it is difficult to distinguish between the true and false needs of patients. True needs represent a service requirement potential that is met or unmet, the unmet needs being of prime concern to the administrator. False needs also can be met or unmet, and the former represents a waste of resources. Utilization data measure both the true and false needs met but cannot measure true needs that are unmet. Therefore, the magnitude of utilization is relative.

3) It is assumed that true diagnoses are known and recorded, since inaccurate diagnoses can bias the results. An assumption has been made that the data have integrity. The data were not collected by the researcher and, since the study was longitudinal in nature, many health records personnel may have been involved in its transcription.

This study is subject to the following data and methodological limitations:

1) The assumption that the data have integrity implies that testing for data validity and reliability is forfeited. Given that verification of reliability and validity is impractical, the analysed data cannot be tested for validity and reliability. Quality control, however, has been exercised by the CPHA (Commission on Professional and Hospital Activities).

2) The unit of analysis was the PAS (Professional Activity Study) separation abstract and not the individual patient. Every inpatient admission, whether a unique event, patient transfer, or readmission for the same disease episode, results in a new patient separation. As a result, utilization data may tend to over-represent the number of disease episodes or individuals treated.

3) Two types of data are employed in this study which may lead to an incongruity. Firstly, cross-sectional data in the form of census data are employed. Census data represent demographic observations at a particular point in time. Although there is an assumption that census data represent an average for the year, the time of census (June) is not in the middle of either the calendar or fiscal year. Secondly, longitudinal data in the form of PAS data are used. Longitudinal data are continuous, dynamic observations over a period of time (in this case 1971 to 1984/85). Use of longitudinal data necessitates the calculation of population estimates for intercensal years. These estimates are subject to some uncertainty and thus any analyses based on these estimates will be limited by this fact.

4) This study is longitudinal in nature and based on historical data. The applicability of the findings to present conditions are thus limited by changes in demographics, funding and other relevant factors. This should not diminish the value and significance of this study.

1.5 Ethical Considerations

Ethical considerations are inherent in any study that involves patient information. The issues in question relate to respect for patient confidentiality and privacy. The study methodology and design minimized these concerns in the following ways:

1) All data used have previously been collected, in the form of PAS separation abstracts. No patients were interviewed. A minimum of two years had elapsed since the last record was included in the data base. Thus the research had neither a positive nor a negative effect on any of the "participants" in the study.

2) Identifiable patient information was not used. All inpatients to Alberta hospitals during the study period were given a unique patient identification number for PAS coding and patient confidentiality purposes. These numbers were not included in the data base available to this researcher. Furthermore, the names of attending physicians were not provided.

3) The interest in this study was not in each individual's clinical aspects, but only in the overall statistical analysis of certain International Classification of Diseases rubrics.

1.6 Definition of Terms

The following definitions are used within the context of this study:

1) (ACUTE CARE) GENERAL HOSPITAL - " a hospital which provides primarily for the diagnosis and short-term treatment of patients for a wide range of diseases or injuries" (Alberta Hospitals and Medical Care, 1984, p.72).

2) ADMISSION - "the official acceptance into a hospital of a patient (including an infant born alive in the hospital) who requires medical and hospital services including room and board" (Alberta Hospitals and Medical Care, 1984, p.71).

3) AVERAGE LENGTH OF STAY (ALOS) - the average number of days inpatients or individuals from a geographical area stay at an institution(s), which is calculated by dividing the number of patient-days by separations.

4) INPATIENT - a person who has been admitted to a hospital for medical and hospital services, and has been assigned an inpatient bed or bassinet (Alberta Hospital Utilization Committee, 1981).

5) PATIENT-DAY (PDAY) - "the day, or portion thereof, which an individual spends as an inpatient in a hospital, usually determined by his/her presence in a facility at 2400 hours" (Toll, 1982, p. 13).

6) PDAYRATE - the number of patient-days per 1000 person-years.

7) PATIENT DESTINATION - the acute care hospital to which a patient is admitted (Toll, 1982).

8) PATIENT ORIGIN - the hospital district in which a patient maintains his/her usual place of residence (Toll, 1982).

9) SEPARATION (SEP) - "the discharge or death of an inpatient" (Alberta Hospitals and Medical Care, 1984, p.72).

10) SEPRATE - the number of separations per 1000 person-years.

1.7 Thesis Format

The text of this thesis has been organized into five chapters. The preceding introduction constitutes Chapter I. Chapter II provides a selective review of the literature relevant to the research objectives and contains background information for the development of the methodologies presented in Chapter III. The results and discussion of the data analyses are found in Chapter IV. Finally, an overall synopsis of the study, a review of the pertinent findings, resulting conclusions, and recommendations for further study are discussed in Chapter V.

CHAPTER II

A SELECTIVE REVIEW OF THE LITERATURE

The following selective review of the literature is intended to present an overview of the research developments and findings related to the area of study. The five main areas of interest included in this review are: (1) the theoretical concepts of need, demand and utilization; (2) the models and determinants of utilization; (3) patient origin-destination methodologies; (4) geographical variation studies; and (5) previous studies conducted in Alberta pertinent to this thesis.

2.1 Concepts Related to Health Services Utilization

Ensuring the efficient allocation of resources is the primary goal of any health care system. Evaluating the state of health of the population to determine its health care needs is also of prime importance. Cost containment is another major thrust in health care today, and the objective of cost containment strategies is to finance the system without negatively affecting health status. Containment of health care expenditures implies that utilization must be restrained or substituted by less costly services. These goals cannot be attained without a comprehension of the relationships among need, demand, and utilization. These relationships are reviewed in the following section.

2.1.1 Concepts Related to Need, Demand and Utilization

The health care system exists to meet health needs of the service population. There are however, substantial conceptual differences in: 1) the definition of need, 2) how to measure it, and 3) whether or not needs are

being met adequately. Without a universally accepted single concept of need, there can be no single definition of health services need (Boulding, 1966). Some terminology has been used interchangeably in the literature, resulting in further confusion of these concepts.

Medical Needs Model

Kalimo (1979a) operationally defined health need as "... the difference between observed and ideal levels of health" (p. 64). Donabedian (1973) proposed that need "... represent a service-requiring potential" (p. 65). Davis (1955 in Ohmura, 1978) postulated that need was a psychological process that, when acted upon, became demand. Fiedler (1981) concurred with Davis, stating that prior to using a health service, an individual or someone on his behalf, must feel his condition warrants medical intervention.

Two parties are usually involved in any discussion of need: the individual (client, consumer) and the provider (physician). The individual's definitions of need are only congruent partially with those of the provider, and the definitions vary between each individual-provider pairing (Donabedian, 1973). This incongruence has led to the medical perspective of need, as determined by the medical authorities, to mean true need and thus requiring services (Feldstein, 1966).

Although the requirement for medical services, as determined by organized medicine, is usually defined as true need, some authors point out that medical opinion cannot properly weigh all the alternatives. Information used by medical experts may be limited or improperly perceived and preferences may differ between providers and consumers (Schaefer, 1975). Stuart and Stockton (1973) suggest that the appropriateness of medical care extends beyond health professionals' assessment of health needs. Medical

diagnosis itself varies between experts and the efficacy of various treatment modalities is debated often (Feldstein, 1966; Bergner and Rothman, 1987).

Individual Needs and Wants

Since the literature equates medically determined needs as true needs, different words and phrases are coined to represent the individual's perceived needs. An individual's perceived need has been termed as "wants" by some writers (Jeffers, Bognanno, and Bartlett, 1971). These authors suggest that wants may differ from true needs primarily due to consumer ignorance about their current health status and available medical services. Shortell (1980) defined wants as "... the quantity of health services which individuals feel they ought to consume..." (p. 50), based on their perceived needs.

Donabedian (1973) commented on unmet and unrecognized needs. Unmet needs occurred when true needs could not be met due to lack of resources, whereas unrecognized need reflected failure on the part of either the individual or physician to identify a condition requiring medical care.

Consumer Demands

In the economic literature, consumer needs are termed as demands. Shortell (1980) defines demand in the strictest sense, suggesting that it is the quantity of services the consumer wishes to purchase while considering preferences for other goods and services. Purchase in the Canadian health care milieu has little meaning (other than when user fees are in effect). The semantic shift from needs to demands reflects a movement from the paternal/professional viewpoint (based on the myth that "doctor knows best") to an economic perspective in which the consumer has a choice in both providers and services used. Use of the term "demand" presents a major epistemological problem in the asymmetry of medical knowledge (Boulding,

1966). Although the patient is demanding services in the economic sense, he has imperfect knowledge in the medical sense and must rely on the provider's information (Evans, 1984). Thus the physician determines what is provided, and the individual does not necessarily receive provision for what he perceives his needs to be nor what he actually demands.

Griffith (1972) divided demand into "expressed" demand (explicit request from individuals or physicians acting on their behalf) and "unexpressed" demand. The former represented actual usage while the latter was indicative of services used in excess of expressed demand, or services that would be used if unrestricted access to services were available. Griffith noted that six possible combinations could exist: 1) need without demand, 2) need without expressed demand, 3) need with expressed demand, 4) without need and without demand, 5) without need and without expressed demand, and 6) without need with expressed demand.

Utilization

Contrary to the somewhat vague definitions of need and demand, the literature consistently defines utilization as the provision of care. Donabedian (1973) states that utilization is the "actual use of service" and Shortell (1980) refers to utilization as the "actual quantity of services that is consumed when demand is translated into care-seeking behavior" (p. 50). Bice and White (1971) note that utilization rates are provider-oriented data which do not take into account the different reasons and motivations people have for seeking medical care.

Over-utilization occurs when utilization exceeds need, and is similar to Griffith's (1972) notion of unexpressed demand. Under-utilization corresponds to Donabedian's concepts of unmet and unrecognized need. There are few hard and fast rules defining over- and under-utilization since

the appropriateness of medical care is difficult to determine (Stuart and Stockton, 1973).

Measurement of Need

Researchers attempt to measure unmet need (under-utilization) by various indices and ratios. Indices of perceived health status, reported symptoms of illness, level of chronic activity limitation, disability days, and use-disability ratios have been suggested as indicators of morbidity (Aday, 1975). Other need variables include those based on diagnosis, symptoms or an individual's perception of self (Hulka and Wheat, 1985).

Chen (1979) noted that no objective measures of need for health services are available. He postulated that appropriate measures of need should differentiate between two types of need: need for preventive services by well people and need for preventive and therapeutic services by sick or symptomatic people.

Kalimo (1979b) suggested that health care needs at the population level could be assessed by interviewing individuals about their use of health services, and then using an expert medical panel, translating the results into quantitative indicators of need. Elinson (1977), stated however, that measurement of unmet need can only be accomplished by medical examinations, since asymptomatic chronic disease is likely under-reported in interviews.

Often included in the utilization literature is the concept of access to health care: without access there can be no utilization. Donabedian (1973) stated that accessibility was a set of intervening factors between capacity for medical care and actual production of care, and that the use of services proved accessibility. Not only must access be measured by the level of use in relation to need (Donabedian, 1973), but access also must be analyzed by

various subgroups of the population (e.g., native) to determine if access is equitable (Salber, Greene, Feldman, and Hunter, 1976). Specific determinants which act as barriers to access are discussed in the following sections.

2.1.2. Summary

There are many articles published on certain aspects of the complex and dynamic interrelationships among need, demand and utilization, but there is no complete thesis on the topic. There is an underlying theme that individual needs lead to expressed demand, which is then evaluated by medical opinion to assess the appropriateness of medical needs. If warranted, these needs result in utilization. The models that can be used to describe utilization and the factors that influence access to and extent of utilization are addressed in the following sections.

2.2 Models and Determinants

The following section describes pertinent health care utilization models currently used to explain health care utilization. The basic differences between each of the models are due to their determinants. Discussion of each of the determinants is preceded by a brief review of the models.

2.2.1 Models of Utilization

In an attempt to explain the complex factors affecting health care utilization, researchers have developed several models to study the effects of certain variables on utilization. The various approaches attempt to explain all or, in some cases, a component of utilization.

Ecology Model

The ecology model, developed by White, Williams, and Greenberg (1961) is based on the premise that physicians usually see only the acutely ill or those with severe chronic conditions. They reported that the illness patterns of patients referred to a university (teaching) medical centre are distinctly different from those prevalent in the whole population. Furthermore, mortality and morbidity rates indicate disease-specific patterns of ill health but do not describe actions of patients and physicians in response to the disease. Thacker, Greene, and Salber (1977) conducted a longitudinal study which showed that physicians need to be aware that a substantial number of sick people never see a physician or only see one for certain illness episodes. This was substantiated by McKinley (1972) who reported a study which showed that 37% of families in Great Britain had members with pain or illness who did not see a physician, despite free health care.

Andersen's Models

In 1968, Andersen described three models of utilization: economic, social-psychological and behavioral. The economic model considers factors involved in both demand (e.g., patient income, ability to pay) and supply (e.g., number of physicians per capita). The social-psychological model used the attitudes, norms and values of the population to explain utilization. The behavioral model was based on three functions: need, enabling factors and predisposing factors. Need, as reflected in hospital care, was best predicted by an assessment of the individual's health status and activity limitation (e.g., the number of disability days), although activity limitation itself was only one of the responses available in different circumstances and was subject to the peculiarities of cultural and socioeconomic groups (Bice and White, 1971). Enabling factors include income, insurance and availability of medical

facilities and practitioner(s). Predisposing factors were demographic characteristics such as age and sex; the propensity toward utilization is predicted by individual characteristics in advance of the onset of disease (Andersen and Newman, 1973). Most predisposing variables are considered immutable since they cannot be altered to influence utilization (Andersen and Aday, 1978), although some variables, such as health care attitudes, are mutable (Branch, Jette, Evashwick, Polansky, Rowe, and Diehr, 1981).

Anderson's Models

Anderson (1972) developed a causal model of the health service system using path analysis. The model indicated a set of four categories of factors influencing utilization: (1) demographic (age, income, and race), (2) organizational (types of insurance and physician practices), (3) ecological (distance from service), and (4) social-psychological (friends and relatives; Anderson, 1973). Anderson (1976) used a social systems model to predict hospital utilization for one county in the western United States which contained sociodemographic, manpower supply and facility availability variables. Wolinsky (1976) stated, however, that path analysis was unable to handle the interaction effects of variables and thus the social systems model was ineffective.

Shortell's Models

Shortell (1980) consolidated the works of Andersen and Anderson into six distinctive types of models including: (1) demographic, (2) social-structural, (3) social- psychological, (4) economic, (5) organizational, and (6) systems approaches. The first five models are similar to previous descriptions. The "systems approach" analyzed patterns of utilization with inputs and outputs (Anderson and Andersen, 1972). The systems model incorporated all of the above models and, while it may be the most realistic, it was also the

most complex (Shortell, 1980). Shortell reported that these models were useful for thinking about health services utilization but explained little actual variation of utilization (generally only 15-25%), and suggested another organizational model based on structure, process and outcome variables would be of more value.

Health Belief Model

The health belief model analyzes physician and hospital utilization for health (preventive or detective measures), illness (discovery of a suitable remedy) and sick role (getting well activities) behaviors (Shortell, 1980). He suggested that four concepts govern whether a person will seek care: (1) perceived susceptibility to disease, (2) perceived severity of the disease, (3) costs versus the expected benefits of seeking care, and (4) a "cue" to initiate response, such as a media campaign. While this model was initially developed to explain use of preventive utilization, it has been used primarily to differentiate between illness behavior (e.g., physician visits) and sick role behavior (e.g., medication taking).

Intrinsically, the most logical model of health care utilization should be one that incorporates the causal nexus between needs and utilization. When need was incorporated as one of the variables in multivariate analysis, it consistently explained the most variance (Hulka and Wheat, 1985). There is however, a certain amount of economic evidence which suggests that some, if not most, utilization is provider-induced (Evans, 1984; Rice, 1984).

Meanwhile, there is a large discrepancy between conceptualizations about the nature of interrelationships in the health services domain and the specific variables used to represent these concepts. The determinants of utilization as identified in the above models are reviewed in the next section.

2.2.2 Determinants of Utilization

The determinants of utilization have been classified into a number of categories including health service system, demographic, individual/societal, and ecological. Ethnicity, which is usually included with demographic determinants, will be treated as a separate entity due to the significant native population in the study area. Although many of these determinants have been analyzed in relation to physician visits (and not hospitalizations), it must be remembered that patients do not admit themselves to hospitals, nor do they usually discharge themselves.

2.2.2.1 Health Service System Determinants

The health service system approach focuses on variables concerned with the organization of physician practices, physician referral patterns, personnel-patient ratios, physician types and hospital bed supply. Andersen and Newman (1973) divided health service system determinants into two major dimensions: those concerned with resources and those involving organization. The resource component relates to the way the population is served (e.g., bed supply and number of physician specialists). The organizational component refers to how medical facilities and personnel are organized and managed.

<u>Bed Supply</u>

The importance of volume of resources has been apparent from the time of Roemer (1961), who coined the phrase that "a built bed is a filled bed". Bed supply has continually been cited as the principle component of utilization. Harris (1975a) suggested that hospital beds tend to create their own demand for utilization. In areas with high bed to population ratios, high admission rates exist (White, Anderson, Bice, Kalimo, and Schach, 1976;

Wennberg, 1979). Indeed, May (1975) estimated that "a 1 percent increase in the availability of hospital beds will result in a one-fifth of 1 percent increase in admissions ..." (p. 146). The supply of beds was the single most important explanation for utilization variations in different regions of the U.S. (Knickman and Foltz, 1985). This trend is not limited to North America since van der Gaag, Rutten, and van Pragg (1975) reported similar findings for Holland, nor does it apply only to large urban hospitals. Northcott and Rall (1983) showed that for small hospitals (i.e., under 100 beds) in Alberta, the greater the number of beds per capita, the higher the utilization. In a similar vein, Roos, Flowerdew, Wajda, and Tate (1986) reported that rural physicians practising in areas with high bed to population ratios admitted greater numbers of patients to hospitals. Stockwell and Vayda (1979) noted that 50% of the variations in Ontario surgical rates could be attributed to resource availability, and in particular hospital beds. Notwithstanding the above findings, a few authors do not correlate hospital utilization with bed supply (Horne and Beck, 1978; Blumberg, 1982; Brewer and Freedman, 1982).

Physician Supply

Physician supply also has been positively correlated with utilization; the greater the number of physicians, the higher the admission rate (Harris, 1975b; Wennberg and Gittelsohn, 1982). Northcott and Rall (1983) stated that for rural Alberta, the more GPs (general practitioners) per 1000 persons, the greater the incidence of surgery. Other studies have stratified physicians into GPs and specialists and compared utilization generated by each group. For example, Chiswick (1976) reported that a higher admission rate is related to more surgeons per capita and is unrelated to nonsurgical physicians. Mitchell and Cromwell (1982) noted that the larger the proportion of GPs who do not perform surgery, the lower the hospital admission rates since

these individuals provide alternative nonsurgical care. Knickman and Foltz (1985) emphasized that the supply of speciality physicians was the second most important determinant of hospital utilization. Weil (1981) noted that increasing the number of subspecialists on medical staffs had increased inpatient utilization.

The characteristics of physicians, other than speciality, also were mentioned as influencing utilization. Roos et al. (1986) found that Manitoba patients treated by younger physicians or physicians trained outside of Canada or the United Kingdom had higher than average lengths of stay (ALOS). Conversely, Kane, Olsen, Wright, Kasteller, and Swoboda (1978) suggested that more recently trained physicians had a style of practice that discouraged hospital use. Bognanni and Phillips (1982) reported that the largest source of variation for hospitalization was in what the physician perceived as a need for hospitalization. Wennberg (1979) stated that physician training could account for this phenomenon; if a patient was admitted for a specific condition when the physician was in training, then he/she would admit a similar patient when in practice. Roos et al. (1986) found that physicians who were classified as high users of hospitals served 27% of the population but admitted 42% of the patients. Physicians at large teaching hospitals were more likely to admit patients (Roos et al., 1986), keep them longer (Blumberg, 1982), and treat patients with more service intensity (Goldfarb, Hornbrook, and Higgins, 1983)

Rural Physicians

Rural physicians in Manitoba had higher admission and readmission rates and their patients had a longer ALOS, in comparison with physicians who had privileges at non-teaching urban hospitals (Roos et al., 1986). More specifically, the authors reported that each rural physician used 6.5 patient

days per admission whereas urban physicians averaged 4.0 patient days per admission, and that rural physicians admitted 31% of their primary care patients in comparison with the 21% of primary care patients admitted by the urban physician.

Hospitals may substitute hospitalization for ambulatory care in rural situations (Kleinman and Wilson, 1977).

2.2.2.2 Demographic Determinants

It has long been an axiom that the utilization of medical services is directly related to demographic characteristics of the population. Age, sex, education and socioeconomic status have all been postulated to directly affect hospital utilization.

Age

Northcott and Rall (1983) found that the elderly were significant users of hospital and surgical services in small Alberta hospitals. Manga, Broyles, and Angus (1987) confirmed a strong, positive correlation between age and hospital use, which increased dramatically in the later years in association with deteriorating health status. The last year or two of life frequently includes one or more hospital stays for a final illness (Gornick, 1982). Roos, Shapiro, and Roos (1984) reported those over 85 years of age were particularly heavy users of hospitals, and Andersen and Aday (1978) stated age and level of illness were the main determinants of service intensity. In one study, age ranked third behind health status and perceived number of symptoms as the best predictor of hospitalization (Nagi and Marsh, 1980). In a U.S. study it was reported that, after controlling for need, the elderly's utilization of hospital services was not affected by level of income, education, race or gender (Branch et al., 1981).

It should be noted that age in itself does not cause increased utilization. There is a distinct difference between a person's physiological age and their chronological age. Age is used as a surrogate for medical needs, since physiological deterioration generally increases with advancing age, and the propensity to use hospital services also increases with age (Manga et al., 1987).

Age-related differences occur in emergency departments and for inpatient utilization. A study at a 200 bed hospital indicated that patients 35 or older represented 50% of all inpatients but only 26% of emergency patients (Walker, 1976). Children (aged 0 to 9) comprised 28% of emergency patients, although only 10% of inpatients.

Age is not the only proxy for health status; employment also influences health status. Blumberg (1987) noted that unemployed men under age 65 often are in poor health whereas the employed elderly generally are in good health.

Sex

Nathanson (1977) and Verbrugge and Wingard (1987) reviewed gender differences in mortality and morbidity. These authors noted that in all developed countries males had higher mortality rates in all age groups, but females reported more acute illness episodes and utilized more health services. Total rates of hospitalization, after being age standardized and excluding obstetrical conditions, were higher for women (Nathanson, 1977). She also reported that: 1) surgical rates in Canada were 1.5 times higher for women, 2) infant mortality in females is 0.5 to 0.67 that of males, 3) women over 65 are less likely than males of that age group to be hospitalized, but when hospitalized have a longer ALOS, 4) married individuals of both sexes have lower morbidity and mortality rates than the unmarried, and 5)

admission rates are 1.5 times higher for women in child-bearing age groups than for men in this age group, exclusive of pregnancy-associated utilization.

Females have higher morbidity rates for chronic conditions although males have higher rates for chronic conditions that are considered life-threatening, such as coronary heart disease (Verbrugge and Wingard, 1987). They attributed the reasons for gender differences in morbidity and mortality rates to biological differences, illness behavior, lifestyles, and differential treatment practices by health care providers. As Verbrugge and Wingard (1987) summarized, males live shorter lives than females and, from a medical viewpoint, are less healthy while living whereas, from a sociomedical perspective, females have less healthy lives.

Socio-economic Status

Utilization of hospital services is dramatically affected by the health service system of the country. The literature was replete with examples of economic barriers to access and differential care in America, although access has been improved since the introduction of both Medicare and Medicaid. Yelin, Kramer, and Epstein (1983) stated that those with lower family incomes face no difference in hospitalization than families with average or high incomes. Blumberg (1984) similarly reported that low income groups had the same total hospital use as those with private health coverage (other than a prepaid group plan). In Canada, national hospital insurance coverage has removed economic barriers to access.

Although social class (e.g., professional, skilled labour) has no direct bearing on whether one is hospitalized, it is related to other factors which do affect the individual's chances of being hospitalized. Marmot, Kogevinas, and Elston (1987) reported that although smoking is ultimately an individual's personal choice, British men in the lowest socioeconomic group were three

times as likely to smoke as those in the highest group. They noted that general improvements to health, as reflected by a decline in mortality rates, do not occur in all classes at equal rates, and that when conditions improve, they tend initially to affect the higher socioeconomic classes.

Education

Hershey, Luft, and Gianaris (1975) and Nagi and Marsh (1980) reported that those with poor educations had no difference in admission rate than those with higher levels of education. Roos and Roos (1982) found that the more educated elderly in Manitoba had higher surgical rates, which conflicted with the findings of Bombardier, Fuchs, Lilliard, and Warner (1977) who reported that, when income was controlled, individuals with poor educations had higher surgical rates.

2.2.2.3 Ethnicity, Morbidity and Mortality

Differential mortality and morbidity patterns have been found in most multiracial societies. Cooper and David (1986) state that environmental forces, mainly social conditions, are the root cause for variability in mortality and morbidity rates between phenotypically different populations. Moreover, Watts (1986) suggested race was a useful variable when

> "... comparing disease rates of genetically similar populations living in different environments and genetically different populations living in similar environments" (p. 20).

Utilization by Race

The American literature contains numerous examples of utilization segregated by race. Specifically for rural communities, Miners, Greene, Salber, and Scheffler (1978) indicated utilization of medical care services was similar for each race although there may have been disparity in the way

whites and blacks report chronic conditions. Greene, Salber, and Feldman (1978) noted that whites reported more illnesses and experienced higher rates of utilization, and suggested that blacks may be: 1) healthier, 2) have a lower perception of illness or higher pain threshold, or 3) have had less favourable experiences with the health care system and did not utilize it unless absolutely necessary. Wilson, Griffith, and Tedeschi (1985) reported that after controlling for age, sex and hospital location, no racial differences in hospitalization rate, ALOS, or surgical rate were observed, except for children. Conversely, Yergan, Flood, LoGerfo, and Diehr (1987) observed that non-whites used surgical services less than whites and received less hospital services for pneumonia treatment. Similarly, Woolhandler, Himmelstein, Silber, Bader, Harnly, and Jones (1985) found that blacks had higher mortality rates than whites in the 0-65 age group for preventable deaths, suggesting it was uncertain whether improvements in the provision of health services had ameliorated health status inequities. Although most of the aforementioned studies dealt with black and white racial differences, the findings may be generalized beyond the black/white racial situations.

Native Health

Registered Indian band members' care is primarily funded by the federal government, which reimburses the provincial government for insured services (Connop, 1983). Indians are interchangeably defined as status, registered or band Indians and all band members are entitled to exactly the same care as non-natives.

Disease-specific mortality rates for Indians are often substantially different from those for non-natives. Rates for some neoplasms, coronary heart disease and cerebrovascular disease are significantly lower for natives than the general populations of the U.S. and Canada (Sievers and Fisher,

1981; Mao, Morrison, Semenciw, and Wigle, 1986), although the lower rate for neoplasms is largely confined to males (Sievers and Fisher, 1983). Although there are dramatic racial differences in disease rates, malignant neoplasms occur in all populations and most epidemiologists consider environmental factors (e.g., diet, cultural practices, pollutants) to be the main contributors. Evidence for this comes from genetic studies showing that the Japanese and Chinese are relatively closer to Indians in genetic make-up but closer to whites in disease prevalence (Sievers and Fisher, 1983). In some areas, however, Indians are exposed to the same environmental conditions as other ethnic groups and thus likely have genetically determined characteristics that blunt the tendency to develop some conditions and enhance the development of other conditions (Sievers and Fisher, 1981).

Natives have higher rates of cancer of the gallbladder, kidney and cervix (Sievers and Fisher, 1981), diabetes mellitis, cirrhosis and kidney failure (Mao et al., 1986) and infections such as meningitis, otitis media and tuberculosis (Postl, 1986). Diabetes was conspicuously infrequent in Indians until 40-50 years ago, but it has reached epidemic proportions in some tribes in the last 20 years (Sievers and Fisher, 1981). Diabetes and obesity are both familial and those tribes with the highest rates of diabetes have the highest rates of obesity, although the genetic link between the two has yet to be proven (West, 1974 in Sievers and Fisher, 1981).

Mortality Rates

Native infant mortality rates approach those of Indonesia or Nigeria (Last, 1982) with respiratory tract infections, such as pneumonia, ranking as the major causes of death (Morrison, Semenciw, Mao, and Wigle, 1986). From 1963 to 1980, infant mortality and perinatal mortality in Alberta declined in relative and absolute terms (Nuttall, 1982). Infant mortality from Sudden

Infant Death Syndrome (SIDS) and low birthweight are serious factors on Indian reserves (Morrison et al., 1986).

Nuttall (1982) stated that the age-standardized death rate for the Alberta Indian population was 15.9 deaths per thousand persons whereas the rate for the Alberta population as a whole was 6.6 deaths per thousand persons. The former rate is high compared to age-standardized Indian mortality rates for other provinces (Mao et al., 1986). Natives in all age groups have higher mortality rates than the non-Indian population and this occurs consistently whether the group in question is all North American Indians, Canadian Indians, or Alberta Indians of any age group (Sievers and Fisher, 1981; Jarvis and Boldt, 1982; Mao et al., 1986; Morrison et al., 1986). Even more tragic are excessively high death rates due to accidents (e.g., fires, firearms) and intentional violence (e.g., homicides and suicides). For example, in 1976 11.6% of Alberta native deaths were the result of fires while heart attacks (or disease) and cancer accounted for only 7.5 and 6.9% of the sex-combined deaths, respectively (Jarvis and Boldt, 1982).

When self-assessed health status was used in Northern Ontario to determine native health perceptions, age was a significant factor; the younger age groups tended to consider themselves in better health than their elders (Young, 1982). Although women used health services more than men, they did not tend to rate themselves as any more ill. Young (1982) investigated living conditions but no association between respiratory illness and overcrowding was found, although the latter influenced the number of skin sores.

Jarvis and Boldt (1982) reported that natives tended to die in clusters of a minimum of two; 52% died together with another native and approximately 25% of the deaths occurred with nine or more persons. They

suggested that death was a social event. One in ten deaths (10.4%) was suicide and 46.3% of all deaths were violent, compared with 12.8% in the Province of Alberta as a whole. Of the violent deaths, 4 out of 5 native deaths were attributable directly or indirectly to alcohol (Jarvis and Boldt, 1982).

The question of native morbidity and mortality rates is pertinent to this thesis. Natives from the four Hobbema bands (Samson, Ermineskin, Louis Bull and Montana) are considered to be in District 81 (Wetaskiwin), and they comprise approximately 15% of the District 81 population (Langelle, 1987).

2.2.2.4 Individual/Societal Determinants

Moderate research effort has been devoted to the study of utilization behavior, in the belief that motivations, perceptions, beliefs and past experiences influence an individual's health service utilization. Many of the studies in this area relate to the conceptual Health Belief Model. Becker, Haefner, Kasl, Kirscht, Maiman, and Rosenstock (1977) have identified six steps in the decision process needed prior to health services utilization: 1) readiness to consider health matters, 2) perception of personal susceptibility to disease, 3) perception of disease severity, 4) perception of alternative treatment efficacies, 5) beliefs about the financial, psychological and physical effects of treatment, and 6) reactions to cues which trigger a response.

McKinlay (1972) suggested that individuals and groups perceive symptoms differently and thus behave differently. The perception of symptoms itself will vary with the individual's scientific knowledge of the disease (Geertsen, Klauber, Rindflesh, Kane, and Gray, 1975). The tenet that different individuals perceive their susceptibility to disease differently is evidenced by the fact that not every one in a population will accept free immunization. Those who are worried about the severity of a particular

disease and their chances of contracting the disease may seek guidance from family and friends. Those groups consisting of a few members with substantial influence over an individual's behavior are called "strong tie" networks while individuals who receive conflicting and confusing feedback have "weak tie" networks (Berkanovic, Telesky, and Reeder, 1981). These authors suggested weak tie networks, when used for symptom specific consultations, lead to more medical care utilization since the confused seek professional advice sooner.

Fiedler (1981) proposed that four conditions must be met prior to utilization of health services. The patient must be aware of a condition requiring care, the appropriate service must be available within a certain time/distance, the individual must have the ability to get there and the service must be acceptable.

Lifestyle

Although humans are aware of certain activities harmful to their health, some persist in doing them. Mason, Bedwell, Vander Zwagg, and Runyan (1980) reported that personal habits and lifestyle, non-optimal disease management, social factors and/or lack of adequate community resources were responsible for 78% of the admissions to two Tennessee hospitals over a 3 month sample period. Alcohol and tobacco accounted for one-third of all "preventable illness" admissions. In another study, 80% of interviewees believed that medical checkups were of value, but only 30% had had an examination in the previous year (Anderson, 1963).

The evaluation of alternative treatments, and beliefs about costs and risks are dependent to a degree on individual attitude and societal norm. Different groups and societies can possess distinct medical cultures (Ohmura, 1978) and tradition remains a key factor in utilization (Geertsen et al., 1975).

Andersen and Newman (1973) suggested societal norms have a major impact on utilization, citing the examples of the increase in hospital births versus home births over the last few decades, and changes in health care funding.

Technology

Technological change is another major determinant of utilization and is inherent in the evaluation of treatment modalities. Technology has allowed hospitals to shift from "custodial" institutions, as they were in the early twentieth century, to the current institutions of "cure" (Andersen and Newman, 1973). The introduction of high technology instruments such as ultrasound and CT scanner imaging have increased hospital utilization. Moreover, these new technologies have generally served as "add-on" services to those used previously (Battista, Spasoff, and Sptizer, 1986). Sloan and Valvona (1986), however, suggest that the reductions in ALOS that have occurred from 1971 to 1981 in American hospitals, as demonstrated by 11 surgical procedures, were directly attributable to technological advances.

The issue of diffusion of new technology is not entirely restricted to the large metropolitan areas. Although the major urban centres undoubtedly receive new technologies sooner than suburban and rural hospitals, competition does exist between hospitals in the U.S. in relation to who will be the next to offer the service.

Impact of Technology

Vayda, Mindell, and Rutkow (1982) commented on the impact of technology on utilization by reporting that more precise EFM (electronic fetal monitoring) has led to increases in the number of Caesarian sections. Wennberg, Bunker, and Barnes (1980) reported that the rate of C-sections doubled between 1965 and 1975 in the U.S., attributing the increase in utilization to use of this new technology (EFM).

Most new technologies have not been rigorously evaluated. An example is provided by Shy, Larson, and Luthy (1987), who reported on EFM in the U.S. EFM was first reported in 1958, was commercially available in 1969, and by 1975, the technique was taught in 278 of 279 obstetrical residency programs. Although EFM had not demonstrably improved patient outcomes, it had become the standard practice in both high- and low-risk labors. Since most obstetrical units had EFM (especially teaching hospitals), traditional ausculation was not taught to most medical students and consequently, younger clinicians had little faith in ausculatory information and were dependent on EFM.

2.2.2.5 Ecological Determinants

Utilization patterns are dependent in part on whether the population in question is rural or urban in composition. Rural dwelling often incorporates a different set of needs, expectations, values and barriers to care. Furthermore, not all rural populations are similar; some rural areas may be as different from other rural areas as they are from metropolitan areas (Hassinger, 1976; Shannon, 1977).

Rural Utilization

Rural residents apparently have higher rates of morbidity and mortality than do their urban counterparts (Wright, 1976). For example, the survival rate from automobile accidents is lower in rural areas, in part due to ambulance response times (Kane, Dean, and Solomon, 1979). Rural residents reported poorer health status and had higher non-surgical hospitalization rates than the urban population (Kleinman and Wilson, 1977). Higher farm accident rates and the difficulty in obtaining prompt care were cited by Hershey et al. (1975) as indicative of higher rural need. Higher prevalences of

chronic conditions were noted in rural populations. For example, Kane et al. (1979) indicated that for the age group under 65, only 13.4% of the urban population had some limitation of activity as compared with 15.8% of the rural non-farm population. Hypertensive heart disease, cerebrovascular heart disease, emphysema, ulcers, arthritis and rheumatism have been mentioned as occurring more frequently in non-urban residents (Davis and Marshall, 1979).

Whether needs are met through hospitalization or primary care, differences in utilization are apparent between rural and urban patients. For those hospitalized, Hershey et al. (1975) offered that if an inpatient lived a great distance from the hospital, they would be kept in slightly longer for follow-up care. Similarly, Roos et al. (1986) suggested that in rural areas, questionable cases were kept in hospital longer for observation purposes. Increased hospitalization also may result from a lack of alternative services (Wright, 1976). Those individuals hospitalized outside their locale could expect to stay an average of 1.64 days longer than patients hospitalized in their own area, even after adjusting for patient transfer between hospitals with different levels of care (Horne and Beck, 1978).

Richardson and Scutchfield (1973) remarked that rural residents always lag behind urban residents in their expectations and awareness of medical care. Rural residents have less information on health care and a less positive attitude toward health care consumption (Ferguson, Lee, and Wallace, 1976). Differences also may be the result of diverse illness behavior patterns, which are attributed to social and cultural characteristics (Shannon, 1977).

Barriers to care exist for all people, regardless of residence, and can be categorized as financial, cultural, psychological, social or linguistic (Kane, 1969; Kane et al., 1979). Attitudinal barriers, either by habit or prejudice, also

were noted to affect utilization (Wright, Kane, Kronhaus, Woolley, and Altman, 1982). To these impediments in obtaining care, the rural resident must add the hindrance of distance.

Distance from Care

A substantial body of literature is available on the effect distance plays in health care utilization. It is important to note that there are two perspectives on the distance issue, that of the patient and that of the provider. The former deals with how far or how long patients are willing to travel for care, whereas the latter involves the areas that a hospital serves. Hospital service areas and service populations will be discussed in a later section.

Historically, distance as a measure of accessibility to care was measured in terms of mileage. A delay in seeking care for a recognized illness has been associated with distance from care (Shannon, 1977). In three northwestern American states, in terms of the average radial mileage distance, 75% of the patients travelled less than 20 miles (Sharp and McCarthy, 1971). Some researchers have noted however, that travel times give a more accurate picture since variable terrain and traffic patterns provide a more accurate reflection of the distance involved (Bosnac, Parkinson, and Hall, 1976).

Rural individuals rarely limit themselves to the immediate community for obtaining goods and services; in fact, they are accustomed to visiting multiple communities to satisfy their needs (Hassinger and Hobbs, 1973). People are willing to travel some distance to purchase "shopping goods" (i.e., department store goods), but will not travel that same distance for "convenience goods", such as food (Makuc, Kleinman, and Pierre, 1985). Since some authors have suggested that the rural resident will only travel as

far as necessary to receive medical services (Shannon, Bashur, and Metzner, 1969), these services must be seen as convenience in nature.

Determinants of Travel

A patient's willingness to travel any specific distance depends on the service anticipated. Kane (1969) found that 72% of rural patients were unwilling to travel more than 25 miles for uncomplicated inpatient services. Cohen and Lee (1985) indicated a positive relationship between willingness to travel and number of beds (and more sophisticated scope of service) in a hospital but noted that travel distance and urban hospital location were deterrents. Drosness and Lubin (1966) suggested that distance travelled for obstetrical purposes was very similar to that for other types of inpatient services. In contrast, McGuirk and Porell (1984) reported that individuals will travel farther on medical-surgical or paediatric trips than they will on obstetrical or gynaecological trips. Basu (1982) correlated emergency room patients' willingness to travel farther distances, with reason for travelling (major and minor causes), age, time of day, and sex, and reported that there was no relationship. Bashur, Shannon, and Metzner (1971) stated that regardless of purpose, there was an individually-determined distance beyond which people were unwilling or unable to go to obtain medical care.

Kennedy (1980) proposed that population characteristics (demographics) rather than delivery system characteristics were the more important determinants of rural travel patterns. Bashur et al. (1971) included ethnicity, occupation, and status as important factors, in addition to demographics. Conversely, Weiss, Greenlick, and Jones (1971) stated that demographic variables had little effect on travel patterns; they believed that organization of the system (e.g., physician location, speciality) was closely linked to travel. Studnicki (1975a) concurred that organizational factors,

including where the physician had admitting privileges, were more important.

Travel Costs

Travel includes not only direct cost but opportunity costs (McGuirk and Porell, 1984). Direct costs are out-of-pocket charges, whereas opportunity costs are associated with appointment-waiting time, travel time, office-waiting time and hospital visiting time costs to spouses and relatives (Wilder and Jacobs, 1987). Some working people (presumably those who are not compensated for sick leave) have high opportunity costs and will travel for care that incurs less lost-earning time (Acton, 1975). Some groups value distance (such as those without automobiles) while others (such as those with dependent families), value time (Koutsopoulos, Meyer, and Henley, 1977).

2.2.3 Summary

A variety of models have been proposed to describe health care utilization. Most models incorporated some measures of demographics, economics, distance to care, social-psychological concepts and delivery system determinants. The most logical model would appear to be one that incorporated a link between health needs and health care utilization.

Five distinct categories of determinants were reviewed. The first dealt with characteristics of the health care system, such as physician number and mix, bed supply, and referral patterns. Differences in practice patterns, which were reflected in utilization, were noted between rural and urban practitioners.

The second major determinant of utilization was demographics. Utilization of health care increases dramatically with increasing age, particularly for those above 85 years of age. Gender-related differences in

utilization were noted; these were attributed to biological differences, illness behavior, lifestyle and differential treatment by providers. Economic status and the education level of the patient had little or no influence on utilization in Canada.

Race and ethnicity was the third major determinant discussed. Calculating morbidity and mortality rates by race would appear to be relevant, since differences between races caused by environmental factors (such as social condition and diet) appear to account for the variability. North American Indians have lower morbidity rates for some carcinomas, coronary heart disease, and cerebrovascular disease than the general population, but they experience higher rates for certain cancers, diabetes, cirrhosis and kidney failure. In addition, Alberta natives have excessively high mortality rates from violence and accidents.

Motivations, perceptions, beliefs and past experience all affect utilization behavior. Different groups and societies possess different medical cultures. Technological change is a major determinant of utilization, since many new technologies function as "add-on" services to existing technology.

Ecological determinants, in particular the effect that rural living plays in utilization, was the final category examined. Rural residents generally have a different set of values than urban residents and distinct rural areas can have widely different beliefs. Rural residents are usually hospitalized longer than urban residents, but it is uncertain whether they actually have a medical need for a longer length of stay, that the utilization pattern is a function of medical staff beliefs and traditions, or that the distance from home affects the length of stay. Rural residents appear willing to travel longer distances for specialized care than they are for uncomplicated services, even though longer travel times involve higher opportunity costs.

In summary, there is no definitive set of determinates.

2.3 Patient Origin-Destination Methodology

The care-seeking patterns of individuals can be used for monitoring and forecasting purposes, planning for new facilities or relocation of existing services, and for assessing the effects of population demographic shifts. Planners use patient origin-destination studies to identify patient flow behavior, since patients are not always admitted to the hospital nearest their residence, and hospitals do not have immutable and non-overlapping boundaries from which to draw their patients.

The origin-destination methodologies involve data analysis of the place of origin (patient's residence) and place of destination (health care facility, hospital) to identify travel patterns. Patient origin data provide a snapshot that can be used in short-term planning (Garnick, Luft, Robinson, and Tetreault, 1987). Furthermore, these methods are useful in delineating service areas (catchment areas), service populations, and in comparing resource utilization from both the provider and community-based perspectives. The following is a review of research germane to these features of health care utilization.

2.3.1 Patient Care-Seeking Patterns

Geographic variations in utilization are better understood if the movement patterns of persons seeking medical care are identified. Demand for care is stochastic in nature and thus it is impossible to precisely predict where service will be requested; only probabilistic statements can be made (Bay and Nestman, 1980). Geographic and political boundaries do not constitute barriers to care and thus the ratios of beds, patient-days,

physicians, or other facilities available relative to the community population or district population may not be meaningful, although they may have value at the regional or provincial level. Furthermore, reporting utilization rates such as occupancy rates, patient-days per capita, and visits per physician does not indicate whether all members of the population have equitable access to facilities. To obtain a more accurate picture of a district's use of health care resources, origin-destination studies have been undertaken.

Behavior

Patient flow behavior was investigated as early as 1945 by Ciocco and Altenderfer. Realizing that quantitative information was needed on "who goes where for care", they investigated the place of puerperal confinement for residents of eight American states. Determinations were made of those who gave birth within their own county; these women were in-residents and the I.R. (in-residence ratio) was the number of births occurring in the county over the total number of births for county residents. The complement of the I.R. ratio was the O.R. (out-residence ratio), which was calculated by dividing the number of county-resident births occurring outside the county by the total number of county births. These ratios established an index of the degree of dependence of one county on the resources of another. Ciocco and Altenderfer (1945) addressed the use of medical trade areas, similar in concept to commercial trade areas, but found that although

> "... the trade area concept may be used to determine broadly the areas of medical service, ... the use of the I.R. and O.R. ratios allows a finer determination of the pattern of intercounty movement of persons seeking medical care with reference to births" (p. 984).

Somewhat surprisingly, there apparently was not a rush to embrace the patient origin methodology proposed in the aforementioned cornerstone

paper. The focus appeared to shift to the individual hospital and its service area. Nonetheless, there were some patient origin studies published.

Origin-Destination Studies

Sharp and McCarthy (1971) analyzed discharge data from Oregon, Washington and Idaho to determine significant patient flow patterns. They concluded that the patient preferred to go to the hospital nearest his residence and the physician preferred to admit the patient into the hospital closest to his office. Patients requiring specialized care were more likely to travel to centres that had large hospitals and specialized staffs, although only seven per cent of patients were in this group.

Meade (1974) investigated patient flow in Idaho using the patient's zip-code address as place of origin. After a six-year intervening period, Meade (1976) again addressed the origin-destination data for Idaho, noting major changes in population size, bed and physician supply. He then compared the two patient origin studies to gauge the effect of changes in these variables, concluding that "... the spatial pattern of hospital-patient interaction between 1967 and 1973 has not changed" (p. 64). He then suggested that a hospital would be better off doing a detailed census block study of its service area, rather than repeating a patient origin study.

Morrill and Earickson (1968) also investigated the variables affecting patient flow. They reported that the relationship between community variables (e.g., population), hospital characteristics (e.g., beds, physicians with admitting privileges) and the intervening variables between them were able to explain two-thirds of the variation in flow pattern.

Patient flow patterns in the Province of Alberta were used to identify acute care hospital regions (Paine and Wilson, 1975). These authors used a computer program to determine a patient flow matrix based on census

subdivisions. Hospital regions also have been delineated in the Province of Nova Scotia using patient origin data. Gordon, Weldon, and MacLean (1974) reported that the demand for hospital care had usually been supplied by the patients' home region. MacLean and Weldon (1977) created a patient flow matrix, based on patient-days, to quantify the degree of regionalization within Nova Scotia. They noted that 83% of all hospitalizations occurred within the region of residence, and that the majority of the remainder were referred to the provincial referral center.

The main theme throughout origin-destination studies is the identification of three categories of geographic regions: 1) the referral centre which serves as a net importer of patients; 2) regions that have a relative balance between exporting and servicing other region's patients; and 3) the dependent region, which serves basically as a patient supplier. Moreover, patient flow methodologies have been employed in a number of pertinent Alberta-based theses; however, these will be reviewed in detail in the section entitled "Relevant Alberta Based Research".

2.3.2 Service Areas

Delineation of hospital service areas, derived from patient origin-destination methodologies, have received a good deal of attention in the health services literature. The utility of having an accurate description of a hospital's service area to hospital trustees and administrators is readily apparent; if it is known who that population is and who they will be in the future, "... a lot of decisions would be made substantially easier" (Griffith, 1968, p. 70).

Service Area Definitions

Various definitions of a hospital's service area have been proposed in the literature, using the terms service areas, catchment areas (basins), study districts, or areas of major influence. Before 1960, "the hospital service area was seen as the smallest geographic subdivision of a planning region whose hospitals provide the overwhelming bulk of the patient days utilized by the population of the area" (Shonick, 1976, p. 61). Marrinson (1964) indicated that a "... circle was drawn around a hospital's location to indicate the approximate service area" (p. 53), but that the area should be considered as a time circle rather than a space circle. Basu (1982) defined a hospital's catchment area simply as the geographical area from which most of the patients originated. Zimmerman (1975) reviewed various definitions used by the American Hospital Association, such as the service area being a "... logical medical and commercial service area ...", and an area "... chosen by an institution as the recipient of a specially developed commitment" (p. 47). Ingram, Clarke, and Murdie (1978) offered that "the service area of a hospital may be regarded as a static representation of the boundary of dynamic interaction processes between users and a nodal facility" (p. 55). Taking a completely different tack, Rowley and Baldwin (1984) postulated that service areas could be determined using an expert rating method, which incorporates the views of banking, hospital administration, government and business. Studnicki (1975a) reasoned that the value of the service area concept was directly proportional to the extent with which patients' actual behavior conformed to the minimization of travel effort.

Market Areas

Discussion of market areas is prevalent in the American literature, reflecting the competitive nature of American hospitals. Generally, market

areas are identical to service areas. Other hospitals that compete for patients or physicians are within a hospital's relevant market (Garnick et al., 1987). Smaller hospitals have smaller market areas (Sharp and McCarthy, 1971), whereas specialized hospitals have patients that travel greater distances (Morrill and Earickson, 1968). Higher occupancy rates result from higher market concentration (Joskow, 1980). Hospitals with more competitive local markets (number of neighbours within 15 miles) had higher production costs than those in monopolistic markets, due in part to duplication of services (Luft, Robinson, Garnick, Maerki, and McPhee, 1986).

The size of the market can vary, depending on the different services available. The acquisition of specialization and technology, such as cardiac surgery and hemodialysis, has led to some hospitals being able to increase their market areas (Zimmerman, 1975). Wilder and Jacobs (1987) stated that the individual disease or procedure determined the relevant product market, and not the general service cluster available at the hospital. Furthermore, they expected geographic markets would be smaller for routine procedures. Examination into the provision of nuclear medicine tests indicated that service was less efficient in a competitive environment (Wilson and Jadlow, 1982). A comparison of inpatients and emergency admissions, however, indicated there was no difference in the size of the market area (Walker, 1976).

Service Areas

A hospital's service area depends, in part, on the community-based physicians who have an ongoing relationship with the hospital (Garnick et al., 1987). Few physicians are willing to locate in a rural community unless they have admitting privileges at the local hospital and full use of the facilities. Furthermore, the scope of available services a hospital can offer is dependent

on its physicians' capabilities and qualifications. Equipment and personnel tend to become centralized, often at the expense of rural areas, which may lose certain services when the population falls below a threshold level (Joseph and Bantock, 1982).

Hospital service areas are also influenced by physician referral patterns (Paine and Wilson, 1975). Due to friendships, specialized skill, reputation, training programs, society affiliations or for whatever reasons, physicians have referral relationships with other physicians which influence the service area for that procedure (Zimmerman, 1975). Griffith, Restuccia, Tedeschi, Wilson, and Zuckerman (1981) suggested that the volume of physician referrals was usually less than 5% of total admissions.

Shonick (1976) reviewed three basic approaches taken by authors to describe service areas: 1) normative, 2) administratively determined, and 3) empirical. Relevant data and appropriate theory are used to draw ideal service area boundaries that optimize certain desired criteria, such as travel time or trade areas, in the normative approach. An authority, such as the provincial government, arbitrarily makes boundaries in the administratively determined approach. Proponents of the administrative approach argue that there are significant advantages in relating public data collection on such things as taxes and census with health service data. The empirical approach involves patient origin-destination data flow patterns. It is used primarily to determine if either of the other two approaches are appropriate, and if not, to assist in redefining service areas. Elements of all three approaches can be integrated.

Distance Minimization

The simplest hypothesis is the distance decay approach, which means simply that patients go to the nearest hospital regardless of whether the

distance is measured in mileage or time. The distance-minimizing approach can be constructed by using Thiessen polygons, where a boundary is drawn

> "... perpendicular to the midpoint of the lines joining ..." the hospital in question "... to each of the surrounding hospitals. The resultant polygon contains those points (potential residential locations) for which ..."

the designated hospital is the closest one (Ingram et al. 1978, p. 61). The aforementioned authors did not find this approach particularly suitable for a metro Toronto emergency department but this approach still has merit in sparsely populated rural areas, depending on the services required. Joseph (1979) noted that physician referrals distort distance minimizing relationships. McGuirk and Porell (1984) stated that the fundamental flaw with the distance decay model was that it treated hospitals as if they were in spatial isolation, and ignored other alternatives.

Equal-Likelihood Approach

The first approach to incorporate patient origin data was the equal-likelihood approach developed by Poland and Lembcke (Griffith, 1972). Geographic boundaries were drawn through townships to establish territories where a clear majority (50%) of the patients would go to one hospital or another (Griffith, 1968). Service area boundaries did not cross, service areas were mutually exclusive, and service areas for very small rural hospitals were totally enclosed within a larger hospital's service area. The major difference between this approach and that of distance minimizing is that the equal-likelihood recognizes that some hospitals have a larger drawing power than others, and thus each hospital has a differently-sized service area. Poland and Lembcke realized that the diagnostic category to which the patient belonged (and thus the inappropriateness of nearby facilities and physicians to treat it), plus physician referral patterns, were

major factors entering the selection process as to which institution the patient would be hospitalized.

Concepts inherent in the equal-likelihood approach are found in the gravity model. This model is based on the premise that the probability of interaction between individuals and potential destinations varies directly with the size of attraction of each service center and inversely with the distance of that service center (Studnicki, 1975b). Using the State of Idaho as a base, Meade (1974) developed formulas that used measures of physician manpower and available facilities (e.g., beds) to determine the area from which a hospital could draw patients. He then mapped patient origin-destination data from admitting records and compared the two, adding more variables to the equation until the projected service areas matched the actual patient-origin areas. Meade (1974) concluded that

> "... areas with a similar population pattern, such as most of the rural west, could find this method useful in planning new facilities" (p. 364).

This model is more mathematical in nature than the equal-likelihood model.

Estimation of urban hospital service areas is substantially more difficult than estimation for rural areas. Drosness, Reed, and Lubin (1965) attempted to study urban service areas by generating numerical patient flow data onto maps of census subdivisions. Khan (1986) used cartographic and centrographic analysis to map urban spatial patterns and to indicate optimal facility location. Morrill and Earickson (1969) integrated the distance minimizing model and the gravity model to develop a simulation model of patient flow in Chicago. One key feature of this study is that it explicitly recognized the physician-hospital interaction.

In summary, suggestions have been proposed to calculate service areas. Relatively simple models with substantial emphasis on distance minimization can be used in rural areas, whereas complex models are needed to estimate metropolitan service areas. One component that was incorporated into most studies was the relationship of service area to a census subdivision.

2.3.3 Service Populations

Development of the concept of service areas was naturally followed by the calculation of service populations. Griffith (1972), who was instrumental in developing methods for the calculation of service populations, noted that the equal-likelihood method proposed by Poland and Lembcke worked only for rural areas and that it would be unlikely that an urban hospital could capture at least 50% of any given geographical area. Another difficulty mentioned was that service areas changed with physician admitting practices and referral patterns. Griffith recognized that the major limitation of the equal-likelihood procedure was that it necessitated a geographic tract to be totally in or out of a hospital's service area (the all or nothing approach), instead of having a gradually decreasing tendency to use a hospital with increasing distance from the facility. Two indices for algebraically calculating a hospital service population, based on an admission-origin matrix, were developed. The relevance index (RI) represented the percentage of total admissions from each tract that go to the study hospital (Griffith, 1972, p. 76), or the hospital's "... share of market in each small area" (Griffith, 1976, p. 39). This measure can be viewed as the proportion of a community's patients that go to a given hospital. Each study tract population is multiplied by the RI (the percentage that use the study hospital) and then the assigned populations from each area are summed to calculate the overall service population

(Griffith, 1978). This number represents not only the actual users but also the potential users (Bay and Nestman, 1980). Both the relevance index and equal-likelihood procedures require data on patient origin and estimates of population in relatively small geographic areas.

The second index developed was the commitment index (CI). The commitment index is hospital-oriented, measuring "... the percentage of total admissions ... which come from (a particular tract)" (Griffith, 1972, p. 76). It measures the proportion of resources allocated by a hospital to residents of a particular service area and is calculated by dividing admissions from the area to the study hospital by the total number of admissions to the study hospital (Griffith, 1976).

Zuckerman (1977) used the RI and CI to measure community-to-hospital flow patterns in Philadelphia. A comparison of the origin-destination data from 1965 and 1974 revealed measurable changes in flow pattern over the 10-year intervening period. The value of using the relevance and commitment indices to forecast each community's pattern of use and its applicability for regional planning purposes was in doubt after Griffith and Wellman (1979) compared forecasts of service, base and market populations for the year 1975, based on the relevance indices from 1967 to 1971, with the actual 1975 data. Forecasts of the base populations were within acceptable limits, but predictions of service populations and bed needs, based on relevance indices, would have resulted in overbedding.

Other Measures

Bay and Nestman (1980) further refined and generalized the methods of Griffith. They determined that the service population could be calculated without reference to the specific catchment area, other utilization measures such as patient-days and discharges could be used in place of admission rate,

and the service population concept could be applied on a regional or provincial level and not just on a single hospital level. Bay and Nestman (1980) compared the RI and CI methods and concluded that either or both methods could be used to compare hospitals or districts for per capita resource consumption. Although the results obtained will not be identical, most of the difference will occur at the minimum or maximum of estimates.

Carpenter and Plessas (1985) suggested that in the absence of discharge data, mortality statistics could be used. They determined that travel patterns of those who die in hospitals are quite similar to the travel patterns of all inpatients, and that in some areas, mortality vital statistics are more readily available and not as voluminous as discharge data.

2.3.4 Resource Utilization

Although valid measures of hospital outputs are unavailable, it would appear desirable to achieve an equitable distribution of resources among all members of society. The free movement of patients from one geographical area to the next has confounded planners and bureaucrats, since measures of utilization such as admission or patient-day are not generally related to patient origin. Residents of some areas may be consuming more than their "fair share" of limited resources. Methodologies are needed to account for patient movement across service boundaries which can also be used to compare communities or service areas. To this end, it becomes necessary to measure resource distribution by a population-based approach, thus matching resources consumed to the population served.

Per Capita Measures

Shaughnessy (1982) described the utility of two measurement methods for constructing per capita measures. The first procedures were community-

based (CB) methods, for which the relevant group is the population of a specific geographic area. Utilization measures of this target population are summed to determine total utilization and then divided by the reference population to determine per capita measures. The second set of procedures are called provider-based methods, and these deal with per capita measures by providers of health care. The population being served is estimated, which then becomes the denominator for numerators of resource consumption, such as number of beds or total operating costs. PB measures reflect the subpopulation served by the provider and thus may not reflect the mean characteristics of the larger population of which they are a part. PB utilization measures for specific provider groups can be affected by consumers switching to different providers, whereas CB measures reflect total utilization. Since CB and PB measures are in the same per capita units, Shaughnessy (1982) recommended using the measures in conjunction with one another.

Shaughnessy (1982) cautioned that certain qualifications were needed in interpreting per capita measures: 1) socioeconomic and demographic characteristics of the population; 2) case-mix severity and changes in the population; and 3) the mix of physicians and physician costs in relation to facility costs. The reliability and validity of the per capita measures should be tested and the geographic units used to calculate the CB and PB measures must be reviewed to determine if they are valid and applicable.

BDI and SPI Indices

Bay and Nestman (1984) incorporated CB and PB measures into two indices. The first index is called the BDI (Bed Distribution Index) and it is defined as "... the number of beds per 1,000 age-sex-adjusted residents and is specific to a hospital district" (p. 146). The second index, the SPI (Service Population Index), is the number of persons served by each bed. The BDI is

district specific and the SPI is hospital specific. Using patient-day measures as an indicator of service demand, Bay and Nestman (1984) used patient-day and census figures to tabulate age-sex-specific patient-day rates for 103 hospital districts in Alberta. They determined that both indices were sensitive enough to detect changes over a five-year period. Bay and Nestman (1984) concluded that SPIs "... are relatively stable over methods or data types ... (and) would provide valuable information for hospital planners " (p. 157).

2.3.5 Summary

In summary, the research studies have shown that quantification of health care-seeking behavior by the use of patient origin-destination methodologies is relevant for both facility-specific and system-wide planning purposes. Patient origin-destination techniques have offered hospitals new opportunities to assess the population to whom their resources are committed and can facilitate the reordering of priorities to meet community wants and needs. Health care-seeking flow patterns may be measured using various indices and then applied to determine if all individuals have equitable access to health care.

Empirical studies have shown that spatial access has a substantial impact on hospital choice. Much of the geographic work has concentrated on the inverse relationship of distance and the population served, using probabilistic spatial distribution models. Since patients do not always travel for care to the nearest hospital, researchers developed patient-origin destination models to delineate service areas and service populations. Further attempts to define service area boundaries led to the formulation of the relevance and commitment indices, which are used to estimate the degree of association between the hospital and a group of subpopulations. Further refinement of

the RI and CI methods allowed service populations to be calculated independent of service areas.

Eventually, sets of procedures called community-based and provider-based measures were constructed to measure utilization on a per capita basis. The former set provides measures of a specific population whereas the latter relates a population subset to a specific health care provider or facility. Population-based per capita measures are important, since per capita differences in resource allocation rates are at the heart of the equity issue.

2.4 Small Area Variation Studies

Most research on the determinants of utilization falls under the general heading of large area studies. Representative subsamples of a large population or from a specific geographic region are chosen and their utilization data are manipulated while holding supply factors constant (Wennberg, 1985). Often the data are in aggregate form such as all surgeries, inpatient-days or admissions. However, when the unit in question is the hospital service area, the research is categorized as a small area study. In small area studies, individuals are assigned to unique geographical areas and all health care utilization events, regardless of where care occurred, are enumerated. This permits data to be age-sex-adjusted and it is from these data bases that population-based disease-specific morbidity and utilization rates can be determined.

2.4.1 Geographical Variations in Utilization

Comparison of utilization rates derived from population-based data reveals that there are often large national and provincial differences. Indeed, variation in utilization rates among regions, and even between adjacent

hospital service areas, can be significant. For example, in 1978 the average length of stay for northeastern region inpatients of the U.S. was 44% longer than for western region inpatients (Rothberg, 1982). While it is plausible that two areas quite distant from each other (e.g., Alberta and Nova Scotia) might have large differences in the general health of their populations, it seems unlikely that health status differences would explain the differences within a province or between adjacent hospital service areas. Interest in geographical variations in utilization was formerly centered around the two issues of access and equity in delivery; currently, cost is the main concern (Wilson and Tedeschi, 1984).

Descriptions of small area variations, although not particularly popular until the early 1970s, have existed for well over a century. Barnes (1982) described what was perhaps the first such study, which was reported in 1856 by W.A. Guy. Guy noted that the annual admission rate for one parish was 1 per thousand while the neighbouring one had a rate of 3.5 per thousand. He reported that this was an inequitable consumption of resources and reflected some inappropriate utilization. Lembcke (1952) compared appendectomy rates in upper New York State by assigning inpatients to their residential districts and then comparing surgical rate variations.

International Studies

More recently, international population-based comparisons in surgical rates have been undertaken by McPherson, Wennberg, Hovind, and Clifford (1982), who analyzed data from New England, England, and Norway. Investigating tonsillectomy, hemorrhoidectomy, hysterectomy, prostatectomy, appendectomy, hernia repair, and cholecystectomy rates, they reported that the first four procedures varied more from area to area than did the last three, and variation appeared more procedure-dependent

than country-dependent. Variations were independent of the method of financing medical care.

Canada, England and Wales, and the United States were compared for changes in surgical rates over a ten year period by Vayda et al. (1982). The overall surgical rate remained unchanged in Canada but had increased by 25% in the United States. Although the number of surgeons had increased in Canada and the United Kingdom, the surgical rate remained constant. There was almost a 300% difference in gallbladder surgical rates between the U.S. and the U.K.; however, the mortality rates were similar (Vayda et al., 1982).

Wennberg and Gittelsohn (1973) investigated hospital service areas in Vermont and found tonsillectomy rates varied from a low of 1.3 per thousand to a high of 15.1 per thousand. Later, they expanded the area of study to include 193 small areas in six New England states and found that for the most common surgical procedures (hysterectomy, prostatectomy and tonsillectomy), the highest rate was six times the lowest rate (Wennberg and Gittelsohn, 1982).

Canadian Studies

Stockwell and Vayda (1979) compared surgical rates for 49 Ontario counties and found highest to lowest ratios of 8.2 for tonsillectomy/adenoidectomy, 7.0 for colectomy, 4.9 for hysterectomy, 4.9 for cholecystectomy, and 4.8 for appendectomy. Conversely, ratios in Wisconsin were only 2.3 for tonsillectomy/adenoidectomy and 1.4 for cholecystectomy (Detmer and Tyson, 1978).

The importance of determining variations in small areas was demonstrated in Saskatchewan where, between 1964 and 1971, the annual number of hysterectomies had increased by 72.1% while the female population over 15 had only increased by 7.6% (Dyck, Murphy, Murphy,

Road, Boyd, Osborne et al., 1977). Hysterectomy rates for the three largest cities were 12.58, 7.55, and 4.99 per thousand, resulting in a ratio of 2.5:1 between the highest and lowest.

A substantial body of information on small area variation is available for Manitoba. Roos, Roos, and Henteleff (1977) reported surgical rate variations in nine health regions for tonsillectomy and/or adenoidectomy ranging from 8.08 to 16.36 per thousand. They investigated the possibility of differences in health but did not find corresponding evidence of increased respiratory morbidity in areas with higher surgical rates; variation also could not be explained by physician distribution. Roos (1984) also compared hysterectomy rates for 33 Manitoba service areas, determining that there was a fivefold variation in surgical rate and that the ALOS for hysterectomy ranged from 8.0 in the lowest service area to 11.6 days in the highest. No relationship was found between the health or socioeconomic characteristics of the population and surgical rates. Surgery rates on the elderly (over 65 years of age) among 56 rural hospital areas ranged from 3.6 to 9.9 per thousand for cholecystectomy, 12.5 to 28.2 per thousand for prostatectomy, and 3.1 to 8.5 per thousand for inguinal herniorrhaphy (Roos and Roos, 1981). Areas with high surgical rates did not reflect the elderly population having greater health needs.

Risk

Widespread variation in surgical rates is cause for concern from two perspectives: risk and cost. Increased probability of iatrogenic complications, nosocomial infections and emotional burdens are associated risks (Connell, Day, and LoGerfo, 1981). Every surgery has an associated mortality rate and thus higher surgical rates may reflect unnecessary surgical deaths.

Regionalization

All surgery entails some degree of risk, and assuming that "practice makes perfect", the question arises as to whether surgery should be regionalized, so that surgeons have greater experience and patients have reduced risk. The question of whether surgeons have better outcomes with higher volumes was addressed by Luft, Bunker, and Enthoven (1979), who concluded that the answer depended in which of the three categories the type of operation belonged. The first cluster included operations that if performed more frequently, produced better outcomes. Examples in this group were open-heart surgery, coronary-artery bypass and vascular surgery. The second group had better outcomes with increased volume to a cutoff point after which better outcomes were not evident. Examples from this group included colectomy and total hip replacement. Those operations with essentially no correlation between frequency and outcome were cholecystectomy and vagotomy. In dealing with the risk issue, Luft et al. (1986) concluded that risk should not be evaluated by area or hospital, since operations are performed by surgeons with assistance from anaesthesiologists, operating room teams and nursing staffs, and that poor outcomes may reflect the positive outcomes from one good surgeon being overridden by the negative results from occasional surgeons.

Variations in surgical rate influence costs directly and indirectly. Increased surgical rates mean higher physician reimbursement, associated staff costs and increased hospital expenditures. Indirect costs are associated with fatalities, and pain and discomfort of hospitalization. Wennberg et al. (1980) estimated that there was

> "... a fourfold difference in surgery-associated deaths per capita and expenditures per capita between populations experiencing

high and low rates of exposure to seven common procedures" (p. 292).

Explanations for Variations

Various explanations have been made to resolve the issue of dissimilar procedure rates. Physician practice style would appear to be a leading candidate. Different procedures appear to develop a "surgical signature" in specific areas, reflecting the practices of physicians in the area (Wennberg and Gittelsohn, 1982). Moreover, physicians deliver services in the same way as they were trained (Wennberg, 1979). This suggests that physicians trained to perform hysterectomies for irregular uterine bleeding will continue to perform this procedure, although other alternatives may be available. That physicians apparently believe that their practice styles are of benefit to the patient was confirmed in a study by Bunker and Brown (1974), who compared utilization of surgical services by physicians, ministers, businessmen and their spouses. Utilization for all group combinations were comparable, except that physicians' wives had higher hysterectomy rates than wives from other groups. They also determined that physicians had 25 to 30% more operations than the average for the overall U.S. population.

Procedures which have debatable efficacies eliciting professional disagreement also have higher variability. McPherson et al. (1982) reported that the variation (among three countries) in appendectomy rate was the lowest of seven common procedures, and attributed this to relative physician agreement on the value of appendectomies. McClure (1982) indicated that adopting conservative practice styles could reduce hospital use rates (e.g., surgical and medical procedures) by 30-38% with no change in outcome.

Stockwell and Vayda (1979) indicated that more than 50% of the variation in surgical rates in Ontario was related to resource availability in

general, and the number of beds in particular. Wennberg and Gittelsohn (1982) also found that the number of beds per capita influenced surgical rate and chances of diagnostic procedures being performed.

Roos and Roos (1982) assessed whether variations in surgical rates were correlated with self-reported health status, population characteristics, and socioeconomic status, and concluded that either the health characteristics of the population did not influence the amount or type of surgical utilization, or that the variables used in their study were too insensitive. Brewer and Freedman's (1982) findings were in conflict with those of the Roos and Roos; they determined that socio-demographic factors explained more than half the inpatient utilization. Roos and Roos (1981) also suggested that high rate area physicians could be referring more patients to specialists outside the area or that individuals in low surgical rate areas may purposefully seek a physician residing in a high rate area.

Variation between small areas is not confined to surgical rates. Connell, Blide, and Hanken (1984) found variations in medical rates as well as surgical rates and noted variation appeared dependent on the specific condition. Lagoe (1986) focused on small area differences in discharge rates and found that variations in rates were caused mainly by minor surgical and medical procedures.

From this review of the literature, it would appear that lack of professional consensus on the value and outcomes of medical and surgical procedures contributes significantly to small area variations in utilization rates. The lack of agreement on appropriate standards suggests that some utilization occurs because the facilities are available and not strictly because of medical need. Wennberg (1987) stated that

> "it is of great interest that when communities have relatively more beds, their physicians tend to admit proportionately more highly variable medical conditions - those conditions for which hospitalization rates are substantially uncorrelated with morbidity" (p. 358).

The larger question of whether a high rate of servicing indicates overutilization or a low rate indicates underservicing remains to be settled. Nevertheless, Evans (1986) stated that regardless of cause, physicians in the past could dismiss or ignore such findings by saying the results "... did not constitute proof of inappropriate clinical behavior ...(but now) the burden of proof has shifted" (p. 604), and it would appear that the evidence of geographical variation in utilization suggested some inappropriate servicing.

2.4.2 Summary

There is little doubt that significant variation exists for health care utilization between areas that ostensibly should have individuals with similar health status. Area variations exist intraprovincially, regionally, nationally and between nations. It would appear that the major cause of the difference in utilization is varying physician belief in the efficacy of various treatments. Different medical schools emphasize different treatment modalities which are reflected in medical practice patterns.

Both risk and costs are increased in high rate areas and there is some evidence that treatment practices could be changed to reflect more conservative approaches without increasing risk and cost to society. Moreover, the efficacy of some procedures is questionable and standards are needed for use in utilization reviews. More studies of this nature may help reduce utilization in future years since areas with high utilization cannot be identified until a study is completed, and clinicians are not likely to change their practice styles until they are aware of a problem. Debate in the medical

literature on the effectiveness of some surgeries and medical procedures, and continuing education also may lower risks, costs and utilization.

2.5 Relevant Alberta Research Studies

A number of Alberta-based studies have used population-based origin-destination methodologies. Paine and Wilson (1975) delineated six hospital regions in Alberta using patient origin-destination data based on census subdivisions. Teixeira (1975) reviewed the aforementioned study and determined that use of general hospital districts was more appropriate than census subdivisions. Raasok (1979) used patient flow data to address regional variations in the supply of Alberta nursing home beds.

Toll (1982) used population-based methods to investigate patients' care-seeking patterns by levels of care - primary, secondary, and tertiary. She determined that patients tend to: 1) minimize distance in seeking health care services, 2) exhibit regional movement patterns when requiring a higher level of care than could be provided at the local district level, and 3) tend to be referred to either of two large, urban districts (i.e., Edmonton and Calgary) for tertiary care.

Per capita surgical utilization rates for six common surgical procedures were estimated by MacDonald (1983). She noted that the Lethbridge and Grande Prairie regions generally had higher surgical rates than the provincial average, while Medicine Hat was generally lower than average. The utilization rates for appendectomy, hysterectomy, cholecystectomy, and tonsillectomy and/or adenoidectomy had generally declined from 1971 to 1978, whereas the Caesarian section rate had doubled and the prostatectomy rates remained constant.

Romeril (1984) used the community-based approach to investigate regional variations in paediatric utilization rates, reporting that rural children requiring referral generally went directly to tertiary care centres and bypassed secondary centres. Similarly, Szafran (1985) used the community-based method to determine that geriatric utilization rates exhibited a high degree of variability among the hospital districts and provincial regions. Allen (1986) investigated psychiatric patient utilization in Alberta, finding a decline in general hospital utilization for these patients from 1971 to 1982/83. Allen determined that most patients who required hospitalization for psychiatric disorders tended to remain in their own hospital district, regardless of availability of facilities or diagnosis.

Maher (1987) conducted research into provincial cardiovascular utilization rates, finding that they declined between 1971 and 1981. She then calculated costs for cardiovascular services, which would have been applicable had Alberta had an American DRG style reimbursement system in place. Sparsely populated rural areas generally had high per capita utilization rates.

The Alberta Hospital Utilization Committee (AHUC), formed by the Minister of Hospitals and Medical Care, investigated hospital utilization and costs in the province. Their 1981 report indicated that both separations and patient-days per thousand declined from 1971 to 1979, while per capita operating expenses increased (AHUC, 1981). The 1985 report dealt with utilization of medical services from 1979/80 to 1983/84 and noted hospital visits per thousand declined slightly over this five-year period (Young and AUC, 1985).

2.6 Chapter Summary

A review of the literature pertinent to this study demonstrated that:

1) A number of models have been suggested to explain health services utilization. There is some debate on the definitions used to describe needs and demands, which results in confusion in interpreting how the determinants of utilization are related to the underlying concepts. A wide array of determinants have been proposed as affecting utilization, but there is some disagreement among researchers as to the relative importance of the factors, and some are simply out of context in the Canadian milieu.

2) Patient origin-destination methodologies have proven to be valuable approaches to studying utilization. The realization that patients did not automatically stay within arbitrarily set boundaries when seeking care led to utilization being attributed back to the patient's district of residence. The utility of determining the relevance index and the commitment index was demonstrated. Advances were made when it was shown that discharge and patient-day measures could be substituted for admission counts to calculate the indices.

3) Per capita measures for deriving resource consumption have value in determining if there is an equitable dispersion of resources among the districts or regions. CB and PB methods both can be used, depending on the nature of the problem being investigated. PB measures reflect a subpopulation being served by a particular provider and thus may not be indicative of the characteristics of the larger population; however, they are useful to the hospital administrator for comparing providers.

4) Small area analysis has indicated that utilization can be highly variable, even between geographic areas as close as neighbouring hospital districts. It is unlikely that there are distinct health status differences between hospital

district populations. The best explanation for differences in utilization patterns seems to lie in the clinical judgement of the appropriateness of treatment. Hospitalizations and procedures associated with diagnoses with a high degree of professional disagreement over the efficacy of treatment have the highest variation in rates. Variation in rates mean that some individuals are exposed to greater risks and some areas have higher costs. Provider treatment preference alone does not explain all the variation; the facilities available to the providers also influence utilization.

CHAPTER III

METHODOLOGY

Primary purposes of this study were to identify utilization trends of hospital services by residents of District 81 (Wetaskiwin) and at the Wetaskiwin General Hospital. The research methodology used to accomplish these goals is described under three major categories: 1) research strategy development; 2) preparation of appropriate data files; and 3) identification and implementation of relevant data analysis strategies. These three rubrics are described in the following sections.

3.1 Research Strategy

The following objectives were formulated for this descriptive, exploratory and longitudinal study:

1) To investigate trends in utilization by Wetaskiwin General Hospital District residents at all acute care Alberta hospitals from 1971 to 1984/85;

2) To describe longitudinal trends in inpatient utilization at the Wetaskiwin General Hospital from 1971 to 1984/85;

3) To describe the patient flow patterns into and out of the Wetaskiwin Hospital District;

4) To investigate the difference in utilization patterns between natives and non-natives from 1977 to 1984/85; and

5) To determine disease-specific and procedure-specific utilization rates for frequently occurring diseases and operations.

All analyses were performed using descriptive statistics, since all residents of District 81 from 1971 to 1984/85 who had occasion to be hospitalized, regardless of location, were included in the data base.

Moreover, descriptive statistics were better suited for this study since the purpose was to characterize the District 81 and Hospital 114 populations. Analyses of resident utilization rates were compared over time, and also with provincial utilization rates.

This study was longitudinal in nature, as opposed to cross-sectional. Cross-sectional studies involve the collection of data at one point in time whereas longitudinal studies examine changes in response over time. In this particular effort, the subjects of interest were District 81 residents and it was their time-related changes in utilization that were being investigated.

Since patients have free movement across hospital district boundaries, the only way to derive population-based utilization measures is to assign utilization to the patient's district of residence. Although the residents may not have received care in their home district, resources were spent somewhere in the province caring for that district's resident. To ensure an equitable resource distribution, planners must be able to determine resource allocation, at least in part, on a population-based per capita basis (Bay and Nestman, 1984). Therefore, both community-based and provider-based approaches were employed, since both the target population and the Wetaskiwin General Hospital were the subjects of study.

3.2 Data Sources

Since one purpose of the study was to examine longitudinal trends in utilization, the use of preexisting data was necessitated. These data were not in a conveniently tabulated form, but were retrieved from an existing database on an abstract by abstract basis.

The data sources were the PAS separation abstracts, Wetaskiwin General Hospital annual reports and federal government census data. A brief description of each of these data sources follows.

3.2.1 PAS Abstracts

Each acute care hospital in Alberta, up until April 1987, had contracted with CPHA (Commission on Professional and Hospital Activities) for the processing of hospital separation abstracts. Hospitals received basic statistical summaries of utilization at their facility each month, and those hospitals that required more sophisticated data breakdown could contract for it. DHMC (Department of Hospitals and Medical Care) insured that hospitals contracted with CPHA by reimbursing them for their costs.

Separation Abstracts

PAS abstracts for residents of Hospital District 81 and all inpatients from Hospital 114 (Wetaskiwin General Hospital) from January 1971 to March 1985 were selected. The PAS separation abstract contains various demographic, diagnostic and procedure variables. In particular, the variables selected from the abstracts pertinent to this study included: a) age; b) gender; c) year of separation; d) discharge status of the patient; e) length of stay (LOS); f) primary, secondary and tertiary discharge diagnosis; g) primary, secondary and tertiary operation; h) Indian band; i) hospital where treatment occurred; and j) patient's hospital district of residence. These data were routinely collected in accordance with criteria established by CPHA.

The reliability of the data was of great concern, since inaccurate physician diagnosis can lead to the results being biased. Furthermore, erroneous transcription of the data also can confound the results. CPHA employs quality checks and therefore reliability must be assumed. Coding

errors, if any, were assumed to be random, of a cancelling nature and without systematic bias.

The unit of analysis for PAS data is "separation" and it may create bias in epidemiological studies. If separations are used, multiple admission patients or those who have been admitted at one hospital and transferred to another hospital will have had two abstract files for one episode of illness, or in effect, one hospitalization episode. Record linkage, which could be used to trace one individual's illness episode, was not employed since it requires identifiable information on each patient and may possibly violate patient's confidentiality. In utilization studies, bias is reduced somewhat by using PDAY (patient-day) as another unit of analysis, since length of stay is more reflective of resource consumption than separation.

Some discrepancies may have arisen in the number of PDAYs per year. The cause of these discrepancies lies in the fact that PDAYs were allocated to the year of separation and not to the year in which they actually occurred. It is believed, however, that the extent of this distortion was likely small and of a cancelling nature.

For conceptual purposes, the Alberta acute care hospital system was considered closed. Although data were available on non-Albertan residents utilizing the Wetaskiwin General Hospital, data were not available for District 81 residents who utilized hospital services outside Alberta. It was assumed that disregarding data for these two groups did not significantly bias the results.

3.2.1.1 Diagnostic and Procedure Codes

During the years 1971 to 1973, the Eighth Revision of the International Classification of Diseases, and the Hospital Adaptation of ICDA (H-ICDA)

which followed, were used for hospital separation abstracts. From 1974 to 1978, the second edition (usually referred to as H-ICDA-2) was in effect. In 1979, the clinical modification of the Ninth Revision of the International Classification of Diseases (ICD-9-CM) was adopted by the CPHA and Alberta hospitals.

The switch from H-ICDA-2 to ICD-9-CM was accompanied by a change in the reporting year from a calendar year (Jan. - Dec.) to a fiscal year (Apr. - Mar.). One result of this change was the loss of PAS abstracts for three months of 1979 (Jan. to Mar.).

Coding changes from one volume to the next preclude comparing some diagnostic and procedure categories with earlier versions; however, this was not a problem since comparison of ID (in-district) and OD (out-of-district) data was accomplished on a year to year basis (e.g., 1975 ID with 1975 OD).

Statistics Canada grouped ICD codes into categories under the heading of CDC (Canadian Diagnostic Coding) and CDL (Canadian Diagnostic Listing). The CDC codes were in effect from 1971 to 1978. The original version of the CDL codes was in effect in 1979/80 and 1980/81, and a modified version was used from 1981/82 to 1984/85.

3.2.2 Wetaskiwin General Hospital Annual Reports

The annual reports submitted by the Wetaskiwin General Hospital to the federal and provincial governments were reviewed for pertinent information. Data on the bed compliment of the hospital were provided. These reports also provided a verification check on annual separations and patient-days.

3.2.3 Census Data

Population-based methodologies require an accurate account of the district population be used as the denominator in the calculations. Statistics Canada has released census data for the years 1971, 1976, 1981 and 1986 tabulated by sex, five-year age group and EA (enumeration areas). DHMC received data for 1971,1976, and 1981 (data from the 1986 census by GHD were not available for this project), aggregated for each GHD (General Hospital District). From these data a population file separated into GHD, sex and five-year age divisions was created. Census data, however, are cross-sectional in that they only measure the population at a given time. Intercensal year population estimates were based on Statistics Canada data and DHMC estimates for GHD 81 (Wetaskiwin). A description of the methodology used to calculate population estimates is provided in Appendix A.

3.3 Data Analysis Strategies

One of the main research objectives of this study focused on hospital utilization by residents and non-residents, and the type and volume of services they received. These analysis were conducted over time, using PAS data. The data were manipulated on the University of Alberta mainframe computer, using the SPSSx (Statistical Package for the Social Sciences) language. The results were then entered into electronic spreadsheet software (LOTUS 1-2-3) on a micro computer to calculate the various indices.

Specific Strategies

Information on patient flow patterns was provided using patient origin-destination methodologies. The hospital district of residence served as the origin variable and the hospital at which service occurred was the destination

variable. Analyses were conducted over time to determine where residents received care (relevance index) and whom the hospital treated (commitment index), and historical trends in both indices were described.

Per capita separation and patient-day rates for district residents hospitalized at Wetaskiwin, and at other acute care hospitals were calculated on an annual basis. Similar calculations were performed on data for the Province of Alberta, and district rates were compared with provincial rates.

A third set of analyses involved separating the utilization data into Indian and non-Indian subsets. Data were available only from 1977 to 1984/85, thus restricting analyses to these years. The data on native utilization were further subdivided by band. Per capita separation and patient-day rates, and average length of stay for each band were compared with non-native utilization rates.

Since the population base involved was relatively small, it resulted in relatively small frequencies in each disease and procedure category. To avoid uncertainty due to small frequencies, analyses were only conducted for the most frequently occurring disease categories. The operations selected for investigation were grouped into three or four year periods, and comparisons of per capita utilization rates were made on this basis.

3.4 Chapter Summary

This study is considered descriptive, exploratory, and longitudinal in nature. The data sources investigated included PAS separation abstracts, Wetaskiwin General Hospital annual reports and federal census data. Utilization patterns and trends were identified by using population-based measures and patient origin-destination methodologies.

Per capita separation and patient-days rates were calculated annually for district residents and for the Province of Alberta. Per capita utilization rates also were determined for each of the four-bands in Hospital District 81. Separation and patient-day rates were calculated for selected CDC and CDL categories. Analyses of selected operations were conducted on a period basis, since insufficient separations occurred in some years to allow analyses on an annual basis.

CHAPTER IV

RESULTS

The presentation of the study results follows the format outlined in Chapter III under data analysis strategies. The three major components of this chapter include a geographic and demographic description of the study area, an examination of utilization trends for Wetaskiwin Hospital District (GHD 81) residents, and an examination of utilization patterns at WGH (Wetaskiwin General Hospital). The results are primarily descriptive and are presented within the context of the overall population trends in the Wetaskiwin Hospital District.

A term commonly used throughout this chapter requires clarification: "resident" refers to residents of GHD 81.

4.1 Alberta and Wetaskiwin Profile

Alberta was divided into 102 mutually exclusive and exhaustive GHDs. These districts vary significantly in geographic area, population size, and type, size and location of acute care hospitals. The majority of Hospital District 81 (Wetaskiwin) is situated to the west of the City of Wetaskiwin and its boundaries approximate the County of Wetaskiwin. The City of Wetaskiwin is located approximately 71 kilometres southeast of the City of Edmonton. Hospital District 81 is generally rectangular, bounded on the west by Alder Flats, on the north by Millet, on the east by Gwynne, and on the south by Hobbema (Figure 1). The distances from the City of Wetaskiwin to Millet, Gwynne, Hobbema, and Alder Flats are 16, 13, 17 and 109 km, respectively.

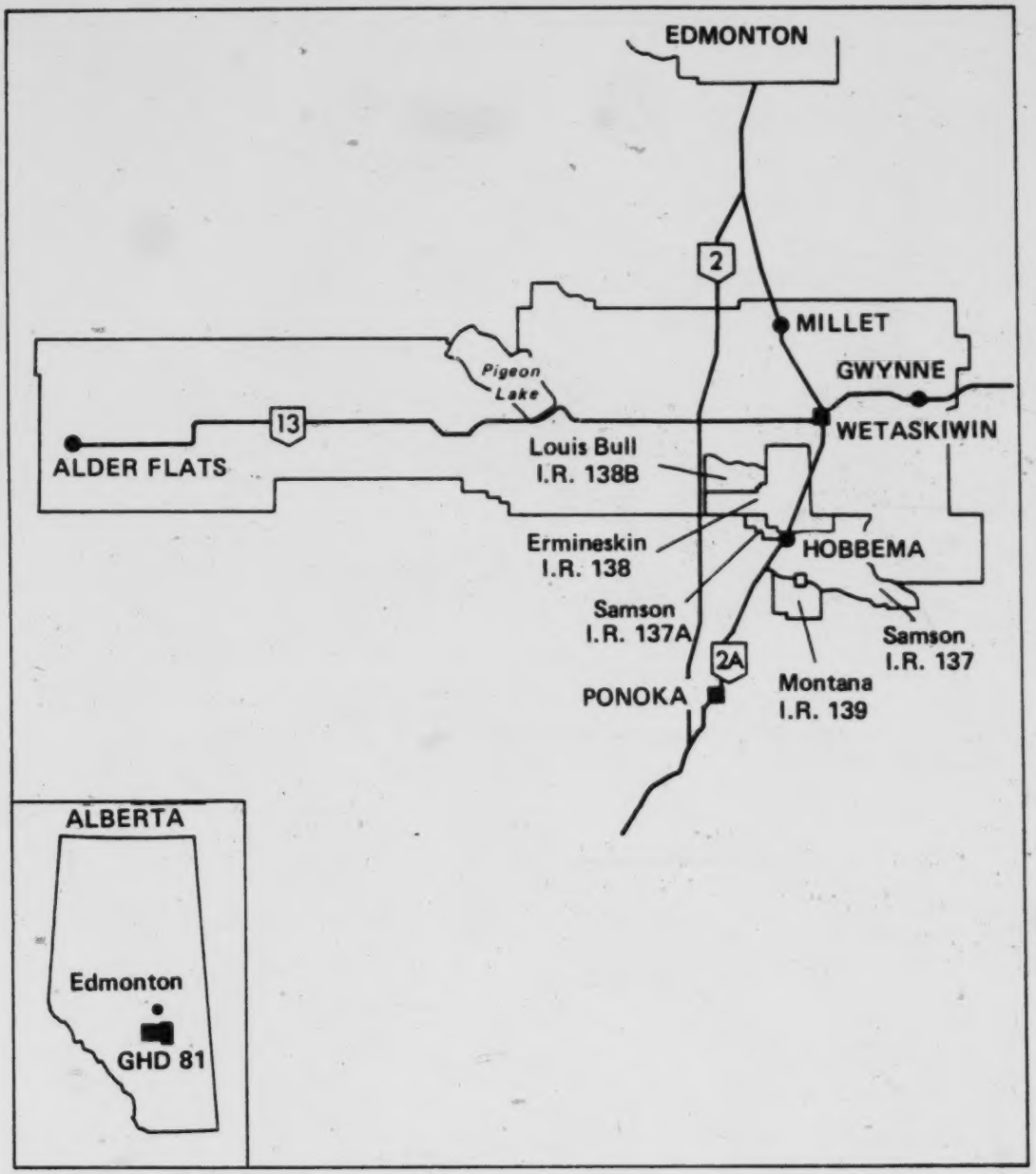

Figure 1. Wetaskiwin General Hospital District (GHD 81).

The County of Wetaskiwin is approximately 3157.5 square kilometres in area, and comprises approximately 0.5% of the province's surface area.

Four Indian bands are included (since 1976) as part of GHD 81 for administrative purposes. These bands are the Ermineskin, Louis Bull, Montana, and Samson. All but the Montana Band have some portion of their reserve in the County of Wetaskiwin.

In 1984, the average income of county and city residents was approximately $15 and $17 thousand per annum, respectively, in comparison with the provincial average of $20 thousand per annum.

4.1.1 Population Trends

The City of Wetaskiwin is the 15th largest city in the province, having an estimated total population of 10,075 in 1986 (Statistics Canada, 1986). The County of Wetaskiwin is the 6th largest provincially in terms of rural population, with a total of approximately 9,520 residents in 1986 (Statistics Canada, 1986).

The Province of Alberta increased in total population by 45.3% from 1971 to 1986 (Table 1). By comparison, the City of Wetaskiwin increased by 60.8% while the County of Wetaskiwin expanded 18.7% in population for this same period. The total percentage increases for the Ermineskin, Louis Bull, Montana, and Samson bands for the comparable period were 78.8%, 86.1%, 71.0%, and 73.1%, respectively.

The increase in population for the province was greatest from 1976 to 1981, when Alberta increased by 21.7% (Table 2). A similar trend occurred in the City and County of Wetaskiwin, with a 24.0% increase in population . The Province of Alberta, and the City and County of Wetaskiwin, increased modestly between 1981 and 1986 at a rate between 5% and 6%.

Table 1. Population estimates for Alberta, GHD 81, and Indians at Hobbema.

Year	Alberta Census[1]	% Change[2]	Combined Estimate[3]	GHD 81 DHMC[4]	% Change[5]	City County[6]	Total 4-Bands[7]	Reserves Only[8]	% Increase[9]
1971	1628.0		16896	14070		14285	3665	2611	
1972	1657.0	1.8	17128	14611	3.8	14428	3779	2700	3.4
1973	1690.0	2.0	17357	15151	3.7	14572	3871	2785	3.1
1974	1722.0	1.9	17670	15762	4.0	14718	3987	2952	6.0
1975	1788.0	3.8	17794	16215	2.9	14865	4118	2929	-0.8
1976	1838.0	2.8	17951	16695	3.0	15014	4324	2937	0.3
1977	1896.0	3.2	18807	17551	5.1	15675	4376	3132	6.6
1978	1954.0	3.1	19646	18392	4.8	16365	4523	3281	4.8
1979	2013.0	3.0	20460	19210	4.4	17085	4648	3375	2.9
1980	2141.0	6.4	21353	20101	4.6	17838	4842	3515	4.1
1981	2237.0	4.5	22352	21090	4.9	18622	5041	3730	6.1
1982	2319.0	3.7	22707	21425	1.6	18813	5267	3894	4.4
1983	2349.0	1.3	23100	21796	1.7	19005	5525	4095	5.2
1984	2341.0	-0.3	23502	22175	1.7	19200	5767	4302	5.1
1985	2338.0	-0.1	23897	22548	1.7	19396	6053	4501	4.6
1986	2365.8	1.2	24268	22898	1.6	19595	6455	4673	3.8
1971-76		12.9			18.7				12.5
1976-81		21.7			26.3				27.0
1981-86		5.8			8.6				25.3
1971-86		45.3			62.7				79.0

[1]Alberta census from Statistics Canada, in thousands
[2]Percentage annual change in Alberta population
[3]City &County of Wetaskiwin, & 4-Band "own reserve" estimate from Statistics Canada & Health and Welfare Canada
[4]Hospital District 81 estimates from DHMC
[5]Percentage annual change using DHMC estimates
[6]City and County estimates from Statistics Canada
[7]Total 4-band estimates
[8]4-Band estimates for persons on own reserve
[9]Percentage annual change in "own reserve" population

Table 2. Alberta population trends for census years 1971, 1976, 1981, and 1986 (from Statistics Canada, 1971, 1976, 1981, 1986).

Age Group (Years)	Population by Census Year								Percentage change in Population		
	1971 A	%	1976 B	%	1981 C	%	1986 D	%	1971-76 (B-A)/A	1976-81 (C-B)/B	1981-86 (D-C)/C
0-4	151600	9.3	152900	8.3	187900	8.4	205100	8.7	0.9	22.9	9.2
5-64	1358255	83.4	1547455	84.2	1886130	84.3	1969500	83.2	13.9	21.9	4.4
Under 65	1509855	92.7	1700355	92.5	2074030	92.7	2174600	91.9	12.6	22.0	4.8
65-74	72075	4.4	85385	4.6	100650	4.5	116500	4.9	18.5	17.9	15.7
75 Plus	47080	2.9	52485	2.9	62840	2.8	74700	3.2	11.5	19.7	18.9
Total 65 Plus	119155	7.3	137870	7.5	163490	7.3	191200	8.1	15.7	18.6	16.9
Total Population	1629010	100	1838205	100	2237520	100	2365800	100	12.8	21.7	5.7

A comparison between the estimated population of Alberta, and the City and County of Wetaskiwin for the years 1971 to 1986 indicated similar annual variation. The annual variation in Indian population estimates indicated that natives generally are increasing in population at a faster rate than observed for residents of the City and County of Wetaskiwin.

4.1.2 Provincial Population Trends by Age Group

Between the years 1971 and 1981, the province had little percentage change in the population of the elderly (age 65 plus); this group comprised from 7.3 to 7.5% of the population (Table 2). From 1971 to 1976, the age 65 plus group increased 15.7% in population, compared with 12.8% for the total provincial population. In the 1976 to 1981 period, this group increased 3.1% less than the provincial total increase (i.e., 18.6% and 21.7%, respectively). However, the percentage increase in the five year period for the age 65 plus population was most noticeable from 1981 to 1986, when this group increased 16.9% compared with a provincial increase of only 5.7% (Table 2). It may be that the economic downturn caused a decline in the young mobile population segment, in relation to the relatively immobile older segment. Evidence for this explanation can be observed in the percentage increases from previous five-year periods, which were 15.7% and 18.6%, respectively, for the age 65 plus population.

The very young (age 0-4) contributed from 8.3% to 9.3% of the total provincial population from 1971 to 1986. Although this age group had a 22.9% increase in numbers during the 1976 to 1981 period, the provincial total had increased 21.7%, and thus the percentage of very young in the provincial population remained relative stable. From 1981 to 1986, the very

young had increased by 9.2%, compared with the provincial total increase of 5.7%.

The higher provincial growth between 1976 and 1981 was due mainly to an increase in the nonelderly population segment, reflecting the influx of employment-seeking migrants into Alberta during the "boom" period. Between 1971 and 1986, the age 5-64 group consistently comprised 83% to 84% of the provincial population.

In summary, the relative percentages each segment of the population contributed to the total Alberta population remained relatively stable in the 1971, 1976, 1981, and 1986 census years. The percentage of elderly (age 65 plus) in the Alberta population increased most noticeably from 1981 to 1986 (Table 2).

4.1.3 Population Trend for Wetaskiwin

The population trends for the City and County of Wetaskiwin based on Statistics Canada estimates differ from provincial trends: the percentage of elderly was higher than found in the province. This difference was most notable for the very old from 1971 to 1981, although apparently there had been a 17.8% decline in this segment of the population between 1981 and 1986 (Table 3). Since it was expected that a modest increase in the age 75 plus segment would occur, it may be that some individuals were not enumerated in the 1986 census, or that coding errors resulted in the decline.

The age group 65-74, however, showed a 45.5% increase during this period. The overall percentage increase (10.6%) for the elderly was less than the corresponding provincial percentage increase (16.9%) during the 1981 to 1986 period, although the percentage increase was greater than the increase for total Wetaskiwin population (i.e., 10.6% and 5.2%, respectively).

Table 3. City of, and County of Wetaskiwin population trends for census years 1971, 1976, 1981, and 1986 (from Statistics Canada, 1971, 1976, 1981, 1986).

Age Group (Years)	Population by Census Year								Percentage change in Population		
	1971 A	%	1976 B	%	1981 C	%	1986 D	%	1971-76 (B-A)/A	1976-81 (C-B)/B	1981-86 (D-C)/C
0-4	1150	8.1	1115	7.4	1625	8.7	1615	8.2	-3.0	45.7	-0.6
5-64	11630	81.4	12140	80.9	14912	80.1	15675	80.0	4.4	22.8	5.1
Under 65	12780	89.5	13255	88.3	16537	88.8	17290	88.2	3.7	24.8	4.6
65-74	755	5.3	825	5.5	935	5.0	1360	6.9	9.3	13.3	45.5
75 Plus	750	5.3	935	6.2	1150	6.2	945	4.8	24.7	23.0	-17.8
Total 65 Plus	1505	10.5	1760	11.7	2085	11.2	2305	11.8	16.9	18.5	10.6
Total Population	14285	100	15015	100	18622	100	19595	100	5.1	24.0	5.2

The percentage of very young (0-4) in Wetaskiwin was slightly less than in the province. There was a decline in the absolute numbers of the very young between 1981 and 1986, and between 1971 and 1976, although these decreases were too small to be of any significance.

To contrast the difference between Wetaskiwin (city and county), and the Province of Alberta, the ratios of very old to very young and elderly to very young were calculated. The very old:very young ratio from 1971 to 1986 ranged from 0.31:1 to 0.36:1 in the province, and from 0.59:1 to 0.84:1 in Wetaskiwin. More striking was the elderly:very young ratio, which ranged from 0.79:1 to 0.93:1 in the province, and from 1.28:1 to 1.58:1 in Wetaskiwin during the 1971-86 period.

Wetaskiwin had a slightly greater share of migrant residents during the 1976 to 1981 "boom" years (i.e., 24.0% increase in total population compared with 21.7% for Alberta). It would appear that these residents were primarily in the younger age groups since the very young increased 45.7% (double the provincial figure) while the elderly segment increase was the same percentage as that for Alberta.

In summary, Wetaskiwin had a greater percentage of elderly residents, particularly in the over 75 segment of the population, than did the province during the 1971-86 period.

4.1.4 City versus County Population Trends

Over the fifteen year period covered by this study, the City of Wetaskiwin had increased in population at a faster rate than the county (i.e., 60.8% and 18.7%, respectively). Most of the city's growth occurred in the 1976 to 1981 period (i.e., 42%) although the county also increased at the greatest rate during this time frame (i.e., 9%).

No major differences in the percentage of the population in each age group were noted, with the exception of the very old. Substantially more of this age group live in the city than in the county, perhaps due to the location of the nursing and senior citizens homes in the City of Wetaskiwin.

4.1.5 Sex Ratios

The provincial male to female sex ratio was 1.02:1 on June 1, 1986. By comparison, the county and city male to female ratios were 1.16:1 and 0.95:1, respectively, on this date. Over the 15 year study period, county sex ratios have changed little, varying between 1.16:1 to 1.18:1. Similarly, city male to female ratios also have varied only slightly, between 0.92:1 and 0.95:1.

4.1.6 Indian Population Trends

As with the non-native population, the Indian population had increased consistently in absolute numbers from 1971 to 1986. Based on Health and Welfare Canada total four-band population estimates, the Indian population increased 76.1%, with the largest percentage increase (28%) occurring between 1981 and 1986.

As a percentage of the combined population estimate, the total four-band population living on their own reserves increased slightly from approximately 15.4% to 19.3% (Table 1). Using only Indians living on their own reserve may artificially inflate the per capita utilization rates for Indians. For example, from 72% to 79% of Samson Band individuals lived on their own reserve; this percentage was from 63% to 69% for the Louis Bull Band over the study period. However, it was not possible to discern from existing data if members of one band were living on the reserves of another of the four-bands, or if they were in another part of the province.

The relative proportion of each band that contribute to the four-bands remained constant over the years. The Samson Band comprised slightly over 50% of the four-bands, and the Ermineskin Band accounted for approximately one-quarter of the four-band population (Table 4.)

It should be noted that a significant number of natives not belonging to the four-bands reside in GHD 81, although it was not possible to estimate this number from federal census data. Indians who were not members of the four-bands, but residents of GHD 81, often represented a substantial proportion of the inpatients at hospitals (P. Langelle, Executive Director, Wetaskiwin General Hospital, pers. comm.)

4.1.7 Summary

The area under study is in central Alberta, south of Edmonton. GHD 81 has similar boundaries to County #10 (Wetaskiwin), although GHD 81 includes all reserve lands of the four Hobbema bands. The population of Wetaskiwin County, including the city, had a higher percentage of age 65 plus residents than the Province of Alberta. The City of Wetaskiwin had a higher percentage of very old residents in comparison with the county. When ratios were calculated individually for the county, and the city, it was determined that more males than females resided in the county, whereas more females than males inhabited the city.

From 1971 to 1986, the Indian population of the four-bands in GHD 81 increased at a faster rate than the non-native population. Four-band members living on their own reserve comprised 15% to 19% of the GHD 81 population. There were significant numbers of Indians residing in GHD 81, who were not members of the four-bands, although population estimates for

Table 4. Numbers and percentages of each band on their own reserve, in comparison with total four-band population on their own reserve, from Health and Welfare Canada.

Year	Total	Ermineskin Band		Montana Band		Louis Bull Band		Samson Band	
		Own Reserve	%	Own Reserve	%	Own Reserve	%	Own Reserve	%
1974	2952	737	25.0	218	7.4	337	11.4	1660	56.2
1975	2929	726	24.8	215	7.3	342	11.7	1646	56.2
1976	2937	737	25.1	220	7.5	346	11.8	1634	55.6
1977	3132	753	24.0	229	7.3	376	12.0	1774	56.6
1978	3281	776	23.7	241	7.3	414	12.6	1850	56.4
1979	3375	807	23.9	246	7.3	437	12.9	1885	55.9
1980	3515	840	23.9	258	7.3	441	12.5	1976	56.2
1981	3730	946	25.4	273	7.3	460	12.3	2051	55.0
1982	3894	993	25.5	296	7.6	487	12.5	2118	54.4
1983	4095	1039	25.4	310	7.6	514	12.6	2232	54.5
1984	4302	1081	25.1	317	7.4	550	12.8	2354	54.7
1985	4501	1134	25.2	323	7.2	572	12.7	2472	54.9
1986	4673	1171	25.1	336	7.2	599	12.8	2567	54.9

this segment of the GHD 81 population could not be obtained from available data sources.

4.2 District Perspective

Analysis of utilization trends from the district perspective in this study entails analyzing hospitalizations for residents of GHD 81, who sought care at any provincial acute care hospital. As noted in Chapter Three, the erasure of identifiable information from the data files precludes "linking" patients; therefore, patients admitted to one hospital and transferred to another hospital will be recorded as two separations. Resultantly, it cannot be said with certainty that the hospital of final destination was the hospital of origin.

4.2.1 Analysis of Relevance Indices

The RI (relevance index) is used as a measurement of the proportion of individuals from a district (i.e., GHD 81) served by a particular hospital or group of hospitals. It essentially indicates the market share of the particular hospital(s) (expressed in this study as separations and patient-days). It measure where district patients are likely to go (or are directed) for care.

The hospitals under study were initially identified by hospital number, and separations per year. Since small numbers of separations were generated by the majority of hospitals in the province, hospitals were aggregated into Wetaskiwin General Hospital (WGH), Edmonton referral hospitals (University of Alberta [UAH], Royal Alexandra [ALEX], Camsell [CAM], Misericordia [MIS], General [GEN]); bordering area hospitals (Ponoka, Camrose, Leduc, Rimbey, Rocky Mountain House, Red Deer and Breton); and all others. Although the W.W. Cross Cancer Institute delivers tertiary care, it was not included in Edmonton hospitals due to its specialized role.

The RI for the Wetaskiwin General estimated by the SEP measure has declined from 1971 to 1984/85 (Table 5). The 1971 RI was 79.4%, and this value had declined to 70.3% by 1984/85. When RI was calculated by PDAY for the Wetaskiwin General, it also declined from a 76.5% RI value in 1971 to 62.4% in 1984/85. This indicates that GHD 81 residents' dependence on the local hospital was decreasing over the study period, suggesting that WGH has not been able to satisfy the needs for the district.

The decline in SEPS RI may have resulted from occurrences such as: 1) bordering hospitals increased their range of available services, and patients closer to these hospitals than to WGH sought care there (distance minimization), 2) patients switched to non-Wetaskiwin physicians who had admitting privileges at other hospitals, 3) patients had an increasing disenchantment with local physicians and/or WGH, and 4) physician referral patterns changed. The decline in PDAYs RI would result if increases in the number or types of specialists in the Edmonton resulted in local doctors referring their patients with more complicated problems and ill-defined conditions to them sooner than they had in the past.

The SEPS RI at Edmonton hospitals ranged from 11.9% to 16.5%, and the PDAYs RI ranged from 16.9% to 26.2%. The annual variation in these indices generally was increasing, although at a relatively minor rate. Both SEPS RI and PDAY RI peaked in the early 1980s. Since the PDAYs RI was generally higher than the SEPS RI, patients separated from Edmonton hospitals likely had an increased severity of illness. This is further substantiated by the observation that most of the utilization at Edmonton hospitals was at UAH and ALEX, both of which are tertiary care hospitals. Findings from previous utilization studies have indicated an increasing dependence on tertiary care hospitals (e.g., Maher, 1987).

Table 5. Relevance indices for GHD 81 residents calculated by SEPS and PDAYs, from 1971 to 1984/85.

Years	Wetaskiwin SEPS[1]	PDAYs	Edmonton SEPS[2]	PDAYs	Border SEPS[3]	PDAYs	Others SEPS[4]	PDAYs	Total SEPS[5]	Total PDAYs[6]
1971	79.4	76.5	11.9	16.9	7.1	4.7	1.6	1.8	4579	39874
1972	75.0	70.4	14.8	22.0	8.1	5.8	2.0	1.8	4614	44401
1973	76.6	71.4	13.2	18.3	7.8	4.9	2.4	5.4	4517	42886
1974	75.4	71.4	14.1	20.1	8.8	6.7	1.7	1.8	4476	39462
1975	75.4	73.3	15.5	19.7	7.4	5.5	1.6	1.5	4247	37372
1976	74.3	71.3	13.7	17.5	10.5	6.4	1.5	4.7	5944	53436
1977	73.0	70.7	15.6	22.5	9.4	5.7	2.0	1.2	6158	55276
1978	73.2	74.3	15.3	17.4	10.0	5.7	1.5	2.6	6446	54820
1979/80	70.1	68.5	16.4	22.9	12.0	7.2	1.5	1.5	6820	58683
1980/81	68.1	64.3	16.3	26.2	14.1	8.0	1.5	1.5	6724	54278
1981/82	68.0	66.4	16.5	22.8	13.7	9.3	1.8	1.5	6582	51256
1982/83	72.7	68.0	13.8	21.4	12.0	9.3	1.5	1.3	7955	55155
1983/84	72.0	61.8	14.3	19.8	11.7	9.6	2.1	8.8	8291	59456
1984/85	70.3	62.4	14.7	21.2	13.1	10.1	1.9	6.3	8823	57549

[1]Wetaskiwin General Hospital

[2]Edmonton Hospitals (UAH, ALEX, MIS, GEN, CAM)

[3]Border District Hospitals (Ponoka, Leduc, Camrose, Rocky Mountain House, Rimbey, Breton)

[4]Other provincial facilities

[5]Total Separations by GHD 81 residents

[6]Total Patient-days by GHD 81 residents

District residents' use of area hospitals increased from 1971 to 1984/85. The SEPS RI ranged from 7.1% to 14.1% while the PDAYs RI ranged from 4.7% to 10.1%. The PDAYs RI, however, was always less in any given year than SEPS RI, suggesting that the utilization at neighbouring hospitals was of shorter duration.

4.3 Hospital Perspective

The Wetaskiwin General Hospital had 135 acute care beds throughout the period covered by this study. Occupancy ranged from 81-88% during 1971 to 1979/80, and from 72-79% in the years 1981/82 to 1984/85. In 1976 some beds were closed for six weeks due to funding limitations, and the nurses' strikes of 1980 and 1982 also resulted in lower percentage occupancy. Approximately 35% of the beds are designated to paediatrics, 33% are assigned to surgery, and 21% are committed to medicine. The remaining beds (11%) are primarily swing beds.

4.3.1 Analysis of Commitment Indices

The CI (commitment index) approximates the relative amount of hospital resources consumed by patients, based on their GHD of residence. In this study, SEPS and PDAYs are used as the utilization measures to derive the indices. Since a CI breakdown by individual GHD was inefficient, GHDs were grouped into the following categories: 1) Wetaskiwin, 2) bordering GHDs (Ponoka, Red Deer, Rocky Mountain House, Rimbey, Leduc, Breton and Camrose), and 3) all others.

The Wetaskiwin General Hospital had two distinct levels of commitment over the study period. Approximately 69% of SEPS CI was for GHD 81 residents in 1971 to 1975, whereas WGH committed approximately 89% of

SEPS to local residents afterwards (Table 6). The increase in SEPS CI after 1975 also was observed for PDAYs CI.

From 1971 to 1975, border area residents had 27-31% of PDAYs at Wetaskiwin; this figure was equivalent to 36-41 of the beds. After 1975 however, border area residents' usage of Wetaskiwin dropped substantially and mean PDAYs per year were less than 25% of pre-1976 values. Since 1976, Wetaskiwin committed 10 or less of its 135 beds to border area residents. Most of the decrease in utilization at WGH was by Ponoka District residents. The increase in CI at WGH and decrease in CI at border area hospitals can be explained by the switching of GHD 81 boundaries. From 1971 to 1975, both the Ponoka and Bashaw hospital districts encompassed parts of the four-band reserves. After 1975, all band members were included as part of the Wetaskiwin GHD.

Other possible reasons for border area residents comprising less of a percentage of WGH patients include an increased range of available services at border area hospitals and patients minimized the distance to care. The increasing commitment by WGH to district residents likely resulted in less beds being available to non-district residents. Alternatively, it may be that the supply of physicians in other GHDs increased, resulting in non-GHD 81 residents selecting physicians with admitting privileges at their local hospitals, rather than physicians with admitting privileges at WGH.

Throughout the study period Wetaskiwin committed less than 6% of its resources to other residents, as determined by SEPS CI. PDAY CI values for residents of other GHDs combined were less than 5%.

The combination of decreasing RI to WGH by district residents and increasing CI of WGH to local residents suggests that the district was exporting more patients than were imported by the local hospital. This

Table 6. Commitment indices for the Wetaskiwin General Hospital calculated by SEPS and PDAYs, from 1971 to 1984/85.

PDays	Wetaskiwin SEPS[1]	Wetaskiwin PDAYs	Border SEPS[2]	Border PDAYs	Other SEPS[3]	Other PDAYs	Total SEPS[4]	Total PDAYs[5]
1971	68.75	67.57	27.53	29.41	3.72	3.02	5286	45172
1972	69.46	69.85	26.29	27.20	4.26	2.95	4983	44742
1973	69.46	69.02	26.71	28.15	3.84	2.84	4980	44367
1974	68.05	67.93	28.06	29.18	3.89	2.89	4958	41470
1975	65.30	65.12	30.58	32.06	4.12	2.82	4905	42076
1976	89.42	90.57	7.59	7.21	3.00	2.22	4941	42071
1977	89.58	91.00	6.44	6.23	3.99	2.77	5019	42932
1978	89.39	91.79	6.76	5.39	3.84	2.82	5280	44400
1979/80	89.62	91.24	6.69	5.86	3.69	2.91	5336	44047
1980/81	88.47	89.95	6.86	6.11	4.67	3.94	5176	38805
1981/82	87.76	90.10	7.25	6.31	4.98	3.59	5100	37759
1982/83	89.06	90.90	5.69	5.13	5.25	3.97	6497	41283
1983/84	89.72	90.61	5.32	4.75	4.96	4.65	6651	40578
1984/85	92.20	93.43	3.48	3.24	4.32	3.33	6729	38436

[1]Wetaskiwin General Hospital
[2]Border Districts (Ponoka, Leduc, Camrose, Rocky Mountain House, Rimbey, Breton)
[3]All other hospital districts
[4]Total Separations at Wetaskiwin
[5]Total Patient-days at Wetaskiwin

indicates a dependence on outside resources and suggests service levels at WGH were inadequate.

4.4 Analysis by Selected Utilization Variables

Analyses were conducted on certain variables to determine trends in utilization at WGH and other hospitals.

4.4.1 Separation Analysis by Hospital

The SEPRATEs from selected hospitals by GHD 81 residents for 1971 to 1984/85 are presented in Table 7. The SEPRATE at WGH ranged from 197.5 in 1975 to 279.8 in 1984/85. No discernable pattern for per capita SEPS was observed for GHD 81 residents at WGH.

Separations per capita for district residents from some Edmonton acute care hospitals (i.e., CAM, MIS, GEN) were relatively stable during the study years while utilization at UAH and ALEX increased substantially. For example, UAH recorded an increase of 22.1 separations per thousand person-years to 27.4 separations per thousand from 1971 to 1984/85. The corresponding SEPRATEs for the ALEX were 8.8 to 13.8 from 1971 to 1984/85. The increased utilization of tertiary hospitals over the year has significant funding implications.

Utilization of surrounding area hospitals on an individual basis followed a more random pattern due to smaller separation frequencies. The SEPRATE increased during the study period for Camrose and Leduc, remained relatively constant at the Red Deer Regional and Rimbey, and declined at Rocky Mountain House and Breton. Grouped together, bordering district hospitals per capita SEPS increased throughout the study period (Table 7).

Table 7. Separations (SEPS) per thousand person-years by GHD 81 residents at selected hospitals, 1971 to 1984/85.

Years	Hospital (groups)					
	Wetaskiwin	Edmonton[1]	Border[2]	Total GHD 81[3]	Province[4]	%[5]
1971	258.3	37.5	16.4	317.6	232.0	137
1972	236.9	42.5	26.4	312.2	234.8	133
1973	228.3	35.5	25.4	296.5	226.4	131
1974	214.1	36.2	28.6	283.7	226.3	125
1975	197.5	36.6	21.6	259.9	219.2	119
1976	264.6	45.8	39.4	355.4	215.4	165
1977	256.2	51.6	34.1	348.9	211.5	165
1978	256.6	50.5	36.3	348.5	206.3	169
1979/80	248.9	55.5	44.5	354.1	203.5	174
1980/81	227.8	52.0	48.7	333.6	188.3	177
1981/82	212.2	48.7	44.7	311.1	180.6	172
1982/83	270.1	48.2	46.6	370.3	192.1	193
1983/84	273.8	52.1	47.5	381.4	189.5	201
1984/85	279.8	56.1	55.3	398.6	192.4	207

[1]Edmonton Hospitals (UAH, ALEX, MIS, GEN, CAM)

[2]Bordering Districts (Ponoka, Leduc, Camrose, Rocky Mountain House, Rimbey, Breton)

[3]Total for GHD 81 residents

[4]Provincial Total for Acute Care Hospitals

[5]GHD 81 utilization rate compared with provincial rate.

As mentioned in the "Analysis of Commitment Indices" subsection, the SEPRATE for GHD 81 residents increased dramatically at the Ponoka General Hospital between 1975 and 1976; 2.3 per thousand person-years were recorded in 1975 whereas 18.4 per thousand were noted for 1976. This upward trend generally has persisted: in 1984/85, the Ponoka General had 31.7 separations per thousand person-years. Changing the district boundary in 1976 likely resulted in the increase in Ponoka SEPRATE.

The total GHD 81 resident SEPRATE increased throughout the study period. Two dramatic increases in the SEPRATE occurred, the first in 1976 and the second in 1982/83. In contrast to the increasing trend in SEPRATE by GHD 81 residents, the provincial SEPRATE declined over the study period. Separations peaked in 1972 at 234.8 per thousand person-years, declining to 180.6 per thousand person-years in 1981/82. The SEPRATE for GHD 81 residents ranged from 119% to 207% of the provincial SEPRATE.

4.4.2 Patient Day and Average Length of Stay Analysis by Hospital

The PDAYRATE exhibited more erratic trends than found for the SEPRATE. GHD 81 resident stays in Edmonton occurred most frequently at UAH, reflective of UAH's tertiary hospital status. The PDAYRATEs at Edmonton acute care hospitals combined peaked in 1977 and again in 1980/81, and have since declined (Table 8).

The PDAYRATEs at bordering area hospitals have steadily increased over the study period. After an initial peak in 1976, which was reflective of the increased PDAYs at Ponoka, PDAYs per capita continued to increase until the end of the study period.

There was a trimodal pattern for PDAYs per capita at WGH. An initial peak value occurred in 1972, which reflected the highest provincial PDAY

Table 8. Patient-days (PDAYs) per thousand person-years by GHD 81 residents from 1971 to 1984/85.

Years	Hospital (groups)					% [5]
	Wetaskiwin	Edmonton [1]	Border [2]	Total GHD 81 [3]	Province [4]	
1971	2169	456	81	2757	1990	139
1972	2139	545	171	2911	2020	144
1973	2021	433	121	2728	1914	143
1974	1787	401	137	2371	1878	126
1975	1690	375	110	2210	1787	124
1976	2282	480	190	3103	1712	181
1977	2226	633	167	3063	1636	187
1978	2216	468	163	2925	1602	183
1979/80	2092	605	202	2943	1566	188
1980/81	1737	635	205	2617	1430	183
1981/82	1613	488	211	2348	1363	172
1982/83	1751	488	212	2484	1430	174
1983/84	1687	487	214	2628	1392	189
1984/85	1619	502	230	2514	1424	177

[1] Edmonton Hospitals (UAH, ALEX, MIS, GEN, CAM)
[2] Bordering Districts (Ponoka, Leduc, Camrose, Rocky Mountain House, Rimbey, Breton)
[3] Total for GHD 81 residents
[4] Provincial Total for Acute Care Hospitals
[5] GHD 81 utilization rate compared with provincial rate.

value. A second peak occurred in 1976, after which per capita PDAY values decreased until 1981/82. The 1982/83 rate rose from the previous year and decreased annually thereafter. Per capita PDAYs at WGH consistently had been higher than the provincial values for acute care hospitals since 1976.

The trend for total GHD 81 PDAYRATE was similar to that found for residents at WGH. The maximum PDAYRATE for both occurred in 1976. Total GHD 81 PDAYRATEs have ranged from 172% to 189% of the provincial PDAYRATE since 1976 (Table 8).

The provincial trend in PDAYRATE was a declining one. PDAYs per capita peaked in 1972 and then declined to 1981/82, after which a leveling-off trend occurred.

Throughout the study period the ALOS in each year at Edmonton hospitals for GHD 81 residents was longer than the resident ALOS at all acute care hospitals (i.e., total GHD 81), and also higher than ALOS at WGH (Table 9). This indicates that residents using Edmonton hospitals, in comparison with residents using other hospitals, have an increased severity of illness. Generally the ALOS trend at Edmonton hospitals was to stays of shorter duration, in keeping with the provincial trends.

ALOS decreased slightly over the study period at UAH, but was the highest of all Edmonton and bordering district acute care hospitals. This signifies the tertiary care role of UAH for residents. Declines in ALOS occurred for residents at GEN, MIS, ALEX, and CAM.

ALOS at three bordering district hospitals (Ponoka, Camrose, Leduc) was investigated and Camrose had the highest value. ALOS values for Leduc and Ponoka were generally comparable until 1980/81, after which ALOS at Leduc steadily decreased. WGH had higher annual ALOS values than any of these hospitals, which may indicate that WGH patients have an increased severity

Table 9. Average length of stays for GHD 81 residents at Wetaskiwin and other locations, and provincial ALOS from 1971 to 1984/85.

Years	Hospital (groups)					%[5]
	Wetaskiwin	Edmonton[1]	Border[2]	Total GHD 81[3]	Province[4]	
1971	8.4	12.1	4.9	8.7	8.6	101
1972	9.0	12.8	6.5	9.3	8.6	108
1973	8.9	12.2	4.8	9.2	8.5	109
1974	8.3	11.1	4.8	8.4	8.3	101
1975	8.6	10.3	5.1	8.5	8.2	104
1976	8.6	10.5	4.8	8.7	7.9	110
1977	8.7	12.3	4.9	8.8	7.7	113
1978	8.6	9.3	4.5	8.4	7.8	108
1979/80	8.4	10.9	4.5	8.3	7.7	108
1980/81	7.6	12.2	4.2	7.8	7.6	103
1981/82	7.6	10.0	4.7	7.5	7.5	100
1982/83	6.5	10.1	4.6	6.7	7.4	90
1983/84	6.2	9.3	4.5	6.9	7.3	94
1984/85	5.8	8.9	4.2	6.3	7.4	85

[1]Edmonton Hospitals (UAH, ALEX, MIS, GEN, CAM)
[2]Bordering Districts (Ponoka, Leduc, Camrose, Rocky Mountain House, Rimbey, Breton)
[3]Total for GHD 81 residents
[4]Provincial ALOS for Acute Care Hospitals
[5]GHD 81 ALOS rate compared with provincial ALOS.

of illness in comparison to the other three, or that WGH had been used as a long-term care facility, in part. Some admissions at bordering district hospitals were likely of a short-term emergency nature, which may have reduced resident ALOS at these facilities.

A comparison of ALOS at WGH to ALOS for the province indicated two distinct patterns. From 1971 to 1979/80, WGH consistently had a higher annual ALOS than found for the province; from 1982/83 to the end of the study period, ALOS at WGH was always lower than ALOS for the province (Table 9). One explanation for these trends is that in 1981, the WGH board of directors approved a bed allocation policy, whereby physicians had a set number of patients they can admit to any individual ward or service, excluding maternity and the intensive care unit (a minimum number of beds on each unit also were reserved for emergency admissions). Physicians may "borrow" beds but this must be arranged between physicians. Langelle (1987) attributed the lower ALOS after 1981 to this practice.

In summary, the PDAYRATE for GHD 81 residents was higher than the provincial rate; it was approximately 1.7 to 1.9 times the provincial rate since 1976. The trends in PDAYRATE at WGH and all hospitals are similar. Resident ALOS was less than provincial ALOS only from 1982/83 onward. ALOS from Edmonton hospitals was consistently higher than for residents at all hospitals.

4.4.3 Separation Analysis by Resident

In 1977, the Department of Hospitals and Medical Care instituted new patient abstract codes that facilitated analyses by Indian bands. Therefore, data specifically on Indian status are available only from 1977.

The SEPRATE for natives was higher than for non-natives in every year studied; it ranged from 256% to 319% of the non-native rate. The trend in

SEPRATE for natives was increasing from 1977 to 1984/85 whereas the trend over the eight years in question for non-natives was generally stable (Table 10). This indicates that hospitalizations per capita for natives are increasing at a faster rate than for non-natives.

The SEPRATE for natives was then broken down by band, to identify different patterns of utilization by each band. The Louis Bull Band (second smallest band size) had the highest SEPRATE from all acute care hospitals, and the Montana Band (smallest band size) had the lowest (Table 11). The Ermineskin Band had a higher SEPRATE than the Samson Band (largest band size) from 1977 to 1982/83 and thereafter, the Ermineskin Band had a lower SEPRATE.

Separations per capita of four-band residents at WGH exhibited a distinct pattern. The Louis Bull and Ermineskin bands had higher per capita separations than did the remaining two bands, and these values generally increased over the study period. The Montana Band SEPRATEs at WGH were the lowest of the four-bands, and were stable throughout the study period. The Samson Band appeared to have an increasing SEPRATE from WGH over the analysis period. Per capita separations at WGH for natives were higher than for non-natives.

Distance minimization probably accounts for some part of the variation in band separations per capita. Hobbema is located midway between Wetaskiwin and Ponoka (i.e., 17 km from both). The Ermineskin and Louis Bull reserves are on the north side of Hobbema, while the Samson and Montana reserves are located south of Hobbema.

In summary, natives have SEPRATEs that are 2.5 to 3.2 times the SEPRATEs for non-natives. Among the bands, the Louis Bull had the highest SEPRATE and the Montana Band the lowest.

Table 10. GHD 81 resident separations and patient-days per thousand person-years at all locations, 1977 to 1984/85.

Years	Non-Indians			Indians			Province		
	SEP. RATE	PDAY RATE	ALOS	SEP. RATE	PDAY RATE	ALOS	SEP. RATE	PDAY RATE	ALOS
1977	269.2	2416	9.0	729.4	6532	9.0	211.5	1636	7.7
1978	277.4	2343	8.6	710.6	5944	8.4	206.3	1602	7.8
1979/80	269.5	2391	8.9	749.1	6094	8.1	203.5	1566	7.7
1980/81	246.9	2060	8.3	763.7	5654	7.5	188.3	1430	7.6
1981/82	231.3	1839	8.0	687.4	5032	7.3	180.6	1363	7.5
1982/83	272.3	1966	7.2	818.2	5309	6.5	192.1	1430	7.4
1983/84	269.0	2125	7.9	859.0	5269	6.1	189.5	1392	7.3
1984/85	277.8	1988	7.2	885.7	5046	5.7	192.4	1424	7.4
1977[1]	127	148	117	345	399	117			
1978[1]	134	146	110	344	371	108			
1979/80[1]	132	153	116	368	389	105			
1980/81[1]	131	144	109	406	395	99			
1981/82[1]	128	135	107	381	369	97			
1982/83[1]	142	138	97	426	371	88			
1983/84[1]	142	153	108	453	379	84			
1984/85[1]	144	140	97	460	354	77			

[1]Percentage of Provincial Rate.

Table 11. Indian separations and patient-days per thousand person-years, and ALOS, by band at acute care hospitals, 1977 to 1984/85.

Years	Ermineskin Band			Louis Bull Band			Montana Band			Samson Band		
	SEP	PDAY	ALOS	SEP	PDAY	ALOS	SEP	PDAY	ALOS	SEP	PDAY	ALOS
1977	766.7	7511	9.8	1359.8	12921	9.5	470.1	4031	8.6	686.6	5817	8.5
1978	817.1	7089	8.7	1477.9	13022	8.8	425.3	3054	7.2	629.3	5184	8.2
1979/80	783.6	6534	8.3	1502.2	13797	9.2	443.9	2568	5.8	706.8	5718	8.1
1980/81	743.4	5254	7.1	1403.3	11613	8.3	431.3	3157	7.3	740.3	5602	7.6
1981/82	741.0	5720	7.7	1333.3	9891	7.4	495.4	3588	7.2	619.6	4391	7.1
1982/83	862.3	5369	6.2	1695.3	11946	7.0	542.5	3505	6.5	738.7	4770	6.5
1983/84	817.3	4619	5.7	1713.3	10894	6.4	525.8	3536	6.7	836.2	5188	6.2
1984/85	846.1	4737	5.6	1682.3	10107	6.0	504.8	2355	4.7	885.6	5135	5.8

4.4.4 Patient Day Analysis by Resident

Natives had substantially higher PDAYRATEs than non-natives at all acute care hospitals from 1977 to 1984/85; the native rate was 248% to 274% that of the non-native PDAYRATE and was 354% to 399% of the provincial rate (Table 10). A further breakdown by band indicated PDAYRATEs followed the same pattern as that for SEPRATE (Table 11).

In contrast to the SEPs and PDAYs per capita trends observed for natives and non-natives, the trend in ALOS was the opposite. For all acute care hospitals, ALOS was equal for natives and non-natives in 1977 and thereafter, natives always had lower ALOS values than non-natives. When ALOS was separated by band, the Louis Bull Band usually had the highest ALOS, but no obvious trends were apparent for the other three bands. The ALOS values for all bands decreased over the study period. The Montana and Samson bands had lower ALOS values than non-natives, regardless of year. The Ermineskin Band members had lower ALOS values after 1978 and the Louis Bull Band ALOS was lower than ALOS for non-natives every year after 1981/82. This indicates that natives (on a per capita basis) were admitted more frequently than non-natives to hospitals, but for stays of short duration.

In summary, the PDAYRATE for natives was 2.5 to 2.75 times the non-native rate.

4.4.5 Analysis by CDL (Canadian Diagnostic List)

The CDL is a grouping of related ICD-9-CM codes published by Statistics Canada. It was originally established as the CDC (Canadian Diagnostic Coding) system, which was in effect prior to 1979. The original CDL version was used in 1979 and 1980, and a slightly modified version was adopted after

1980. Resultantly, three different diagnostic coding systems have been in use during the study period, and the groupings are not directly comparable across all codes. Regardless, some rubrics have remained relatively consistent from 1971 to 1984/85, and these are used to demonstrate GHD 81 residents' diagnosis-specific utilization in comparison with the province.

The largest number of separations per capita from provincial acute care hospitals were included in the CDC and CDL major category of "Complications of Pregnancy and Childbirth". The SEPRATE ranged from 23.6 to 29.2 from 1971 to 1984/85 (Table 12); the trend was stable throughout the study period. In comparison, the SEPRATE for GHD 81 residents was 79% to 89% of the provincial SEPRATE prior to 1976, whereas afterwards, the SEPRATE was 12% to 56% higher than for the province.

The provincial PDAYRATE for this major CDC and CDL category declined over the study period, from 143 days per thousand person-years to 117 days per thousand person-years. In comparison, the GHD 81 PDAYRATE trend fluctuated (Table 13). The maximum PDAYRATE for GHD 81 residents of 190 per thousand person-years coincided with the highest provincial PDAYRATE after 1972.

Since the numbers involved were relatively small, only the most frequently occurring CDC and CDL individual categories for residents were selected for investigation. These were upper respiratory infection, normal newborn, pneumonia, and senility and ill-defined conditions. The minimum number of separations that occurred in a year for the above mentioned categories was 68, and there were only two years with separations of less than 100 individuals.

The SEPRATE for upper respiratory infection was substantially higher for GHD 81 residents (Table 12); the rate ranged from approximately 1.2 to 6.5

Table 12. SEPRATE by CDC and CDL category, 1971 to 1984/85.

Years	Obstetrically-Related Categories			Normal Newborn			Upper Respiratory Infection			Pneumonia			Senility & Ill-Defined Conditions		
	GHD 81	Prov.	%	GHD 81	Prov.	%	GHD 81	Prov.	%	GHD 81	Prov.	%	GHD 81	Prov.	%
1971	21.0	24.7	85	13.2	13.2	100	20.4	8.3	246	10.9	7.5	145	6.3	4.8	131
1972	21.4	24.1	89	11.7	12.2	96	14.9	8.4	177	11.8	8.4	140	4.7	4.5	104
1973	19.2	24.2	79	11.4	12.3	93	11.7	7.7	152	14.3	6.2	231	9.2	7.4	124
1974	21.0	23.6	89	12.9	16.1	80	11.2	8.3	135	13.8	6.7	206	6.6	7.8	85
1975	19.9	23.6	84	13.3	16.7	80	8.3	7.1	117	14.0	6.5	215	6.5	7.9	82
1976	27.5	24.6	112	18.7	17.2	109	12.5	6.8	184	25.6	6.0	427	7.5	8.5	88
1977	30.6	24.8	123	21.1	17.4	121	11.2	6.5	172	22.1	5.6	395	7.5	8.7	86
1978	33.2	25.1	132	21.0	17.3	121	14.2	5.8	245	21.9	4.6	476	9.1	8.5	107
1979/80	37.3	28.8	130	22.3	18.4	121	18.7	5.8	322	16.3	3.7	441	13.8	7.7	179
1980/81	38.8	28.6	136	23.3	18.5	126	24.5	5.1	480	14.1	3.6	392	13.7	7.2	190
1981/82	37.7	28.1	134	22.8	19.1	119	19.6	3.0	653	11.5	3.2	359	13.2	6.6	200
1982/83	39.0	29.2	134	25.0	19.5	128	19.6	3.2	613	18.1	3.7	489	16.8	7.4	227
1983/84	39.0	28.1	139	23.9	19.2	124	19.3	3.3	585	15.3	3.2	478	22.0	8.0	275
1984/85	42.8	27.5	156	24.7	19.0	130	16.1	3.0	537	15.5	3.2	484	25.6	8.2	312

Table 13. PDAYRATE by CDC and CDL category, 1971 to 1984/85.

Years	Obstetrically-Related Categories			Normal Newborn			Upper Respiratory Infection			Pneumonia			Senility & Ill-Defined Conditions		
	GHD 81	Prov.	%	GHD 81	Prov.	%	GHD 81	Prov.	%	GHD 81	Prov.	%	GHD 81	Prov.	%
1971	135	143	94	85	78	109	179	48	370	130	70	185	26	19	143
1972	130	138	94	77	73	106	113	47	243	141	77	182	22	17	129
1973	115	133	86	76	70	109	95	48	198	205	64	321	57	41	141
1974	118	126	93	84	96	87	89	47	191	166	67	249	37	46	79
1975	111	124	89	83	96	87	63	40	160	173	62	277	38	49	78
1976	152	124	122	111	96	116	91	37	247	330	57	578	115	50	233
1977	163	122	134	124	94	132	84	33	252	278	52	535	37	56	65
1978	167	122	137	122	92	132	117	31	383	287	45	645	46	53	86
197980	190	133	143	125	107	117	154	28	543	185	36	521	90	45	202
1980/81	178	128	139	138	100	137	204	27	768	151	37	411	79	40	199
1981/82	176	123	143	120	104	115	146	13	1149	107	33	322	64	35	183
1982/83	180	126	143	130	106	123	122	14	848	161	35	466	75	40	186
1983/84	164	119	138	126	99	127	112	12	902	150	27	548	93	42	220
1984/85	171	117	146	126	100	126	95	12	803	148	33	447	111	43	259

times that of the provincial SEPRATE. The PDAYRATE for residents was even greater than the SEPRATE; in 1981/82 this rate was 11.5 times the provincial rate (Table 13). This indicates that the incidence of upper respiratory infection was substantially more prevalent for residents than for the province as a whole.

The SEPRATE for GHD 81 residents in the category of normal newborn began the 1970s equal to the provincial SEPRATE. It was below the provincial rate until 1975, after which it was consistently higher than the provincial rate. This would indicate that the birthrate per capita was higher for residents than for the province as a whole. Population estimates for City and County of Wetaskiwin residents (Tables 2 and 3) substantiate this for the 1976 to 1981 census period, although the five-year percentage change from 1981 to 1986 indicated this subgroup of residents had a declining birthrate. The PDAYRATE for residents was usually higher than the provincial PDAYRATE, which may indicate physicians (primarily at WGH) kept newborns in hospital slightly longer than was the provincial norm.

The provincial SEPRATE for pneumonia diagnoses declined over the study period from a high of 8.4 in 1972 to a low of 3.2 in 1984/85. In contrast, the SEPRATE for residents was approximately 1.5 to 5 times the provincial rate. It would appear that residents were more prone to contacting pneumonia, and/or that physicians tend to hospitalize patients with greater frequency than their provincial counterparts. Trends in PDAYRATEs for residents and for the province reflected SEPRATE trends.

The SEPRATE for the senility and ill-defined conditions category was higher for GHD 81 residents from 1971 to 1973, and from 1978 to 1984/85, than the provincial rate. In the latter period, the resident SEPRATE was approximately 2 to 3 times the provincial rate. The PDAYRATE reflected

SEPRATE trends. It may be that more residents requiring long-term care were utilizing acute care facilities than was the provincial norm.

It should be noted that SEPRATEs for GHD 81 residents in all categories but senility and ill-defined conditions increased substantially in 1976, over the previous five-year period. The ratio (%) of the resident SEPRATE to the provincial SEPRATE also increased in 1976, and this was the year members of the four-bands began to be included as part of GHD 81. Although the data by individual categories were not subdivided further to differentiate between native and non-native utilization rates, it seems logical to assume that native utilization of hospital services in these categories made a significant contribution to the high utilization rates for GHD 81 residents. In light of the very high utilization rates in these categories, it is suggested that epidemiological studies in certain areas (e.g., native upper respiratory infections) would be of benefit.

In summary, the SEPRATEs for residents were higher than the provincial rate from 1976 to 1984/85 for obstetrically-related categories (combined). The SEPRATEs for upper respiratory infection and pneumonia were much higher than the provincial rates.

4.4.7 Analysis by Selected Operations

The large number of procedure codes precluded conducting analyses on the SEPRATEs and PDAYRATEs for all operations performed in the province over the study period. Furthermore, the codings in some cases changed following revisions of the ICD classifications. Therefore, only selected primary operations were chosen for review.

To obtain significant numbers of individuals, the years 1971-73, 1974-76, 1977-80/81 and 1981/82-84/85 were aggregated. The minimum number of separations in any period was 57.

The SEPRATE for tonsillectomy with or without adenoidectomy was significantly higher for GHD 81 residents than the provincial SEPRATE. It was from 2.3 to 4 times the provincial SEPRATE (Table 14). The SEPRATE for the province indicates a declining trend over the study period; the resident SEPRATE also exhibited a declining trend. The high tonsillectomy SEPRATE for residents is not surprising in view of the high SEPRATE for upper respiratory infections.

The SEPRATE for cholecystectomy performed on residents differed little from the SEPRATE for the province. The resident SEPRATE was 1.0 to 1.2 times the provincial rate.

The provincial trend for appendectomy as the primary operation showed a declining trend over the study period; the trend for GHD 81 residents was more random. SEPRATEs for residents were 0.9 to 1.4 times that for the province.

The trend in provincial SEPRATE was a declining one for total abdominal hysterectomy, whereas it declined for residents in the 3rd and 4th periods, after peaking in the second period. However, the SEPRATE for residents ranged from 64% to 104% of the provincial SEPRATE.

The SEPRATE for GHD 81 residents declined for hemorrhoidectomy over the study period. However, the SEPRATE for residents ranged from 167% to 217% of the provincial rate.

The SEPRATE for circumcisions on residents ranged from 90% to 115% of the provincial SEPRATE. There was a declining trend for this procedure in the province and for residents.

Table 14. Total separations per thousand person-years (SEPRATE) for selected operations at Wetaskiwin and other hospitals by GHD 81 residents from 1971 to 1984/85.

Operation	Hospital or Group[1]	Year			
		1971-1973	1974-1976	1977-1980/81	1981/82-1984/85
Tonsillectomy	Wetaskiwin	10.8	9.4	8.1	6.1
	GHD 81	11.8	10.4	9.4	7.2
	Province	5.1	3.9	2.5	1.8
Cholecystectomy	Wetaskiwin	2.8	2.6	1.8	1.5
	GHD 81	4.2	3.7	2.6	2.4
	Province	4.1	3.2	2.3	2.0
Appendectomy	Wetaskiwin	3.3	1.7	1.8	1.8
	GHD 81	3.7	2.0	2.2	2.3
	Province	2.6	2.2	1.9	1.6
Total Abdominal Hysterectomy	Wetaskiwin	1.3	1.4	0.9	0.7
	GHD 81	1.8	2.4	1.6	1.5
	Province	2.8	2.3	2.1	1.9
Hemorrhoidectomy	Wetaskiwin	1.3	1.3	0.9	0.8
	GHD 81	1.7	1.5	1.3	1.0
	Province	1.0	0.8	0.6	0.6
Circumcision	Wetaskiwin	4.7	3.6	3.2	3.1
	GHD 81	6.0	5.4	5.2	4.6
	Province	6.7	6.0	4.9	4.0

[1]SEPRATE for GHD 81 residents at Wetaskiwin General Hospital
Total SEPRATE for GHD 81 residents
Provincial SEPRATE.

There was a decreasing trend for these operations in the province over the study period. A similar pattern was observed in the SEPRATEs for district residents, with the exception of the appendectomy SEPRATE which had remained relatively stable from 1974 to 1984/85.

4.4.9 Observations on Patients' Preferences

The selective review of the literature indicated reasons why patients are admitted to any particular hospital. These include distance minimization, service availability, social reasons and type of care needed (e.g., primary, tertiary). Of primary significance are physician admitting privileges, since patients generally select their physician and the physician selects the hospital.

The trend by hospital boards to limit the number of physicians with admitting privileges likely has reduced the opportunity a patient has to go to the hospital of choice. For example, a patient from GHD 81 may have his physician in Ponoka, but may prefer to be hospitalized in Wetaskiwin. If the physician doesn't have privileges at WGH, the patient must: 1) be admitted to Ponoka, 2) be referred to a physician with WGH privileges, or 3) present himself at the WGH emergency department requesting treatment.

With recognition of the aforementioned factors, an attempt was made to evaluate how patients perceive their treatment at WGH. This was done by evaluating the separations for elective operations. It was felt that patients with, for example, symptoms of acute appendicitis will likely go to the nearest hospital. For conditions not perceived to be life-threatening, the patient has a greater range of options available.

A crude estimate of patient preferences over time was conducted by calculating the operation-specific relevance index of SEPS at WGH to SEPS for all GHD 81 residents for the aforementioned periods. Procedures selected for

examination were: 1) tonsillectomy with adenoidectomy, 2) tonsillectomy without adenoidectomy, 3) cholecystectomy, and 4) hemorrhoidectomy. The primary reason for choosing these operations was that they were considered elective. Secondary reasons were that tonsillectomies were likely performed on teenagers and pre-teens, cholecystectomies and hemorrhoidectomies were likely performed on middle-aged and elderly patients, and there were substantial separations for these procedures from which to base the observations. A minimum of 57 separations occurred in any period, and for most periods more than 100 separations were recorded.

Tonsillectomy operations are usually accomplished on younger individuals, and parental decisions are likely to predominate. The choice of hospitals reflects, in part, parental perceptions of the local hospital and their child's physician(s). The relevance index of Wetaskiwin to GHD 81 for both tonsillectomies with and without adenoidectomy remained stable throughout the study period. For the more frequently performed procedure (with adenoidectomy) the index ranged from 91% to 98%, and in the 1980s remained constant. The index for tonsillectomy without adenoidectomy was more variable, ranging from 58% to 81%, and in the 1980s the index was increasing moderately.

The cholecystectomy index ranged from 63% to 70%, and in the last four years was at 63%. The hemorrhoidectomy index was variable, ranging from 69% to 87%, and in the final four years of study was at 80%.

Analyses of these indices suggested that patients were content with the service provided by WGH and their physicians. It is understood that patients cannot express displeasure by refusing to go to WGH for a second operation; tonsils can only be removed once. But they can utilize other hospitals for next episode of care. It is hypothesized that if residents were displeased with the

treatment they received, their perceptions of care would circulate in their local community and avoidance of WGH would occur. Avoidance behaviour was noted as a factor contributing to annual variations in SEPS, especially within relatively homogenous groups such as the four-bands of Hobbema (W. Atkinson, Executive Director, Ponoka General Hospital, pers. comm.).

However, analysis of the overall relevance and commitment indices indicated that a greater percentage of GHD 81 residents were seeking care at acute care hospitals other than WGH, while WGH was increasing its commitment to local residents.

It may be that service levels at WGH are inadequate. The increasing frequency with which residents were hospitalized at other hospitals suggests that in part, they cannot receive services they require or simply could not be admitted to WGH within the required time frame. The occupancy rate for non-emergency beds could indicate whether this suggestion has merit.

Non-resident perceptions of the quality of care by WGH staff and physicians, and/or of the adequacy of service levels may be decreasing, as indicated by the declining commitment index values for non-residents. However, these declines have been small since 1976. The district population has increased over the study period while the supply of beds remained constant, and residents may have been given preference over non-residents for available beds. Non-resident switching from GHD 81 physicians to other physicians also may account for this decline.

Distance minimization undoubtedly plays an important role in where residents go for care. Some County of Wetaskiwin residents are closer to other hospitals and these hospitals may have increased their service levels and thus increased their market share of GHD 81 residents. However, distance minimization alone cannot account for the decrease in the relevance index.

Approximately 40% of district residents live in the City of Wetaskiwin and a substantial portion of the remainder have WGH as the closest hospital. It may be that an increasing percentage of residents are selecting non-local physicians with admitting privileges at other hospitals and thus disregarding the distance minimization hypothesis.

Another suggestion as to why the relevance index was decreasing for WGH is that physician referral patterns may have changed. Local physicians may refer patients directly to Edmonton specialists rather than admit them first to WGH.

In summary, there is cause for some concern among the administrators of WGH. The increasing dependency of GHD 81 residents on other hospitals, plus the decline in non-residents using WGH suggests that service levels are inadequate or that people are increasingly becoming dissatisfied with local physicians.

4.5 Summary

The relevance index indicated that GHD 81 residents increased their relative usage of Edmonton hospitals and bordering district hospitals over time. UAH was the principle Edmonton hospital utilized and Ponoka was the primary bordering area hospital used. The increase in the percentage of hospitalizations at acute care hospitals other than the local hospital came at the expense of WGH. The SEPS RI for WGH declined throughout the study period.

From 1971 to 1975, Wetaskiwin committed from 65% to 69% of its resources (based on SEPS) to residents of GHD 81. Thereafter the CI ranged from 88% to 92%. The major reason for the significant change in the CI was a

change in district boundaries. In 1976, members of the four-bands of Hobbema were included in GHD 81.

SEPRATEs for GHD 81 residents were consistently higher than SEPRATEs for the province and they exhibited an increasing trend over the study period, while the corresponding rate for the province was decreasing. The PDAYRATE rate for the province declined since 1972; this trend was not apparent for GHD 81 residents. GHD 81 residents PDAYRATE ranged from 1.2 to 1.9 times the provincial rate. WGH had higher annual ALOS values from 1971 to 1979/80 than calculated for the province; after this year WGH ALOS values were lower than for the province. This was attributed to allocating beds to physicians.

Non-Indian separations per capita from all facilities combined have remained constant from 1977 to 1984/85, while per capita separations for Indians have been increasing. Indians, however, consistently had lower ALOS values. The Louis Bull Band had the highest SEPRATE and PDAYRATE of the four-bands, while the Montana Band had the lowest per capita rates.

The SEPRATE in the CDC and CDL major category of complications of pregnancy and childbirth for GHD 81 residents was less than the provincial rate from 1971 to 1975; it was higher than the provincial SEPRATE thereafter. An identical trend was recorded for the individual category of normal newborn. The SEPRATEs for upper respiratory infection and pneumonia categories were always greater than provincial SEPRATEs. The SEPRATE for senility and ill-defined conditions has been increasing over time for GHD 81 residents; this trend was not apparent for the provincial SEPRATE. Since 1979/80, the SEPRATE for residents was approximately double to triple the provincial SEPRATE, suggesting increased utilization of WGH by long-term care patients. Increases in the SEPRATEs after 1975 were attributed in large

part to inclusion of the Hobbema four-bands in GHD 81, and suggest the need for epidemiological studies in certain areas (e.g., upper respiratory infection).

Operations on GHD 81 residents having SEPRATEs that were consistently higher than provincial rates were tonsillectomy (both with and without adenoidectomy), and hemorrhoidectomy. Operations with SEPRATEs similar in most years to the provincial SEPRATE included cholecystectomy, appendectomy, and circumcision. The SEPRATE for residents for total abdominal hysterectomy was usually less than the provincial rate.

It should be noted that only selected diagnostic and operation categories were reported. Separation rates for other categories tended to be higher than provincial rates, although insufficient numbers of separations in some years/periods precluded the reporting of these data. The pattern of high separation rates for district residents in comparison with provincial rates is consistent with other utilization studies (e.g., Szafran, 1985; Maher, 1987), which have shown that rural residents increasingly use more hospital services in comparison with their metropolitan counterparts. Rural residents appear to be increasing their utilization of the urban hospitals as well as the local facilities. While the disparity between local and provincial separation rates appears great, the high proportion of natives in the district may have been responsible for this, at least in part.

The question of residents' perception of WGH is confusing. The procedure-specific relevance indices for some operations had remained constant or increased in the 1980s; for others the index declined. Moreover, the increased utilization of acute care hospitals other than WGH suggests that service levels were inadequate at WGH, physician referral patterns

changed, or residents were increasingly becoming dissatisfied with the quality of care by their physicians or WGH staff.

The number of beds at WGH remained constant over the study period while the district population increased approximately 63%, and this had the effect of substantially reducing the available bed supply. This is one explanation for inadequate service levels. The reduction in bed supply had occurred across province, however, suggesting that WGH may not be coping as well under these constraints as are other hospitals.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

The major objectives of the study, the data analyses employed to accomplish those objectives, and study findings are summarized in this chapter. Relevant conclusions and recommendations are presented in the final subsections.

5.1 Summary

Hospital administrators and planners are constantly faced with the challenge of determining which services to provide, where to provide them, and at what service intensity level. Administrators need to define who utilizes their hospital and which services they require. It also is important for administration to determine where district residents are receiving care and, if possible, the medical reasons for the hospitalization.

The primary purpose of this study was to explore the utilization patterns of Wetaskiwin General Hospital District (81) residents. In view of the aforementioned purpose, the study objectives were designed to: 1) investigate utilization rates and trends for district residents at acute care hospitals other than Wetaskiwin; 2) estimate rates and trends in utilization at the Wetaskiwin General Hospital; 3) describe patient-flow patterns into and out of the district; 4) describe utilization rates and trends for natives and non-natives; and 5) determine rates and patterns of utilization for frequently occurring procedures and diagnoses categories.

A selective review of the literature was undertaken in order to develop a theoretical and methodological framework for this study. The literature indicated that although many articles were published on certain aspects of

the complex and dynamic interrelationships of need to demand and utilization, there was no cohesive theory on the topic. A variety of models have been proposed to describe health care utilization, and they incorporated measures of the health care system and provider characteristics, demographics, economics, distance to care, and social-psychological concepts. The literature review indicated the potential utility of patient origin-destination methodologies for quantitatively analyzing patient care-seeking behaviors.

Due to the nature of the study objectives, the research strategy employed was exploratory and descriptive. Using retrospective, longitudinal data, hospital utilization patterns for district residents were identified and described. The methodology involved determining hospital utilization on a per capita basis employing population-based utilization rates. Utilization by district residents at Wetaskiwin and other acute care hospitals was compared with provincial rates.

The data analyses were conducted in four major parts, corresponding to the overall study objectives. The first set of analyses involved determining the relevance indices for district residents - where residents seek care. The second analyses set examined the hospital district of origin for patients utilizing the Wetaskiwin General Hospital. Thirdly, differences in per capita utilization rates for natives and non-natives were investigated. Finally, the fourth set of analyses examined the separation and patient-day rates for selected diagnoses and operation categories.

5.2 Major Findings

The major findings of this investigation of hospital utilization by Wetaskiwin General Hospital District residents are summarized below.

1) Analysis of patient care-seeking patterns for residents of the Wetaskiwin Hospital District indicated that:

a. Residents of the Wetaskiwin Hospital District decreased their dependence on the local hospital throughout the study period. The Wetaskiwin General Hospital's market share of district residents requiring hospitalization decreased from a high of 79% to a low of 67%. The largest annual decline occurred from 1971 to 1972, when the WGH share fell from 79% to 75%.

b. The decrease in Wetaskiwin's market share of GHD 81 residents corresponded to an increase in other acute care hospitals' market share of district residents. Separations from Edmonton hospitals ranged from 12% to 17%, and were shown to be increasing over the study period. The highest per capita separation rates from Edmonton hospitals occurred for the University of Alberta Hospitals, which was the closest tertiary care hospital for most district residents.

c. Bordering district hospitals also increased their market share of district residents. Throughout the study period, the relevance index increased from 7% to 14% for border district hospitals. Most of the separations from this group of facilities occurred at the Ponoka General Hospital.

d. The Wetaskiwin General Hospital increased its commitment to district residents over the study period. From 1971 to 1975, the range was from 65% to 69% for residents; afterwards, the index ranged from 88% to 92%. The boundary of GHD 81 was changed in 1976 to include the reserves of the four-bands of Hobbema.

e. A corresponding decline in the commitment index to residents of bordering districts was noted; the decrease was from 31% to 3%.

2) Per capita separation rates for district residents consistently were higher than the provincial rate; the district rate was 119% to 207% of the provincial

rate. Major increases in per capita separation rates occurred in 1976 and 1982/83. The rates for patient-days per capita exhibited similar trends.

3) The average length of stay for district residents was longer than that for the province from 1971 to 1980/81; however, for the final three study years, the average length of stay was less for residents than in the province. In most years the average length of stay for residents at the Wetaskiwin General Hospital was less than the rate for district residents at all acute care hospitals combined.

4) Natives had higher per capita separation rates than non-natives in all years investigated. Native rates were from 256% to 319% of non-native rates. Broken down by band, the Louis Bull Band had the highest per capita separation rates and the Montana Band had the lowest rates. The trend in patient-days per capita resembled separation rates.

5) As a primary diagnosis, district residents had lower per capita separation and patient-day rates from 1971 to 1975 for the CDC (Canadian Diagnostic Code) and CDL (Canadian Diagnostic List) major category of complications of pregnancy and childbirth than the province. Afterwards, both sets of rates were higher than corresponding provincial rates. The individual category of normal newborn reflected the same patterns as those of the major category.

6) Per capita separations and patient-day rates for the individual categories of upper respiratory infections and pneumonia as the primary diagnosis always were higher for district residents than for the province. There was an increasing disparity between the resident rate and provincial rate for both categories over the study period. The maximum per capita separation rates for district residents for upper respiratory infections and pneumonia were 6.5 times and 5.0 times, respectively, that of the provincial rate. The differences

between the maximum per capita patient-day rates for residents and for the province were even greater than the separation rates.

7) The per capita separation rate for the category senility and ill-defined conditions as the primary diagnosis for district residents increased steadily from 1975 onwards, whereas a distinct trend was not exhibited in provincial rates.

8) The per capita separation rates for tonsillectomy with or without adenoidectomy were 2.3 to 4.0 times the provincial rate. Hemorrhoidectomy rates on a per capita basis were 1.6 to 2.2 times the provincial per capita separation rates. Per capita separation rates for district residents were slightly higher than provincial rates for cholecystectomy and appendectomy operations, although they were lower for total abdominal hysterectomy procedures.

5.3 Conclusions

The conclusions arising from this study are the following:

1) The use of longitudinal and retrospective data, and the inclusion of all separation abstracts for district residents in the data base meant that a descriptive approach was suitable for study purposes. The utility of calculating utilization rates by both the community-based and provider-based methodologies to provide an overall perspective on district resident utilization was evident.

2) The value of annually determining where district residents sought care (relevance index) and who utilized the local hospital (commitment index) was demonstrated. Any marked changes that occurred would be apparent to administration relatively early on, allowing mitigative action to be undertaken.

3) The decreasing dependence of district residents on the Wetaskiwin General Hospital may be cause for concern by hospital administration. Service levels may be inadequate, in that residents cannot be admitted to Wetaskiwin due to bed unavailability or that they may not have access to the treatment facilities/expertise they require. Physician referral patterns may have changed such that residents are directed to specialists elsewhere without being first admitted to the local hospital. Residents may have become displeased with local physicians or treatment at Wetaskiwin, and began seeking care elsewhere. It may have been that service levels increased at other area hospitals, and residents closer to these institutions have minimized travel.

4) The increasing commitment of the Wetaskiwin General Hospital to local residents also is a concern. It may be that local physicians have increased their service levels to district residents, resulting in the unavailability of beds for non-district residents. Alternatively, increased service availability at other hospitals may account for the decreased utilization by non-residents. Services available from the Wetoka Health Unit (e.g., home care, ambulatory care, public health) require review and comparison with units in similar hospital districts, since the availability of these services impact on inpatient utilization.

5) The increasing per capita separation and patient-day rates for residents, in contrast to decreasing provincial rates, indicate that district residents are increasing their consumption of health care services. This implies that district residents were receiving more than their fair share of health care resources and casts doubt on the equitable distribution of these resources throughout the province.

6) The overall higher utilization rates for natives in comparison with non-natives suggests either poor overall health in some segments of the Indian

community and/or inappropriate utilization. Moreover, the high resident rates for upper respiratory infections and pneumonia indicate that native child health may require particular attention from health care professionals. It may be that community health unit service levels are inadequate.

7) The tonsillectomy rate for district residents was up to 4 times higher than the provincial rate, and utilization at Wetaskiwin was 85% to 92% of total district resident utilization. The high rate, in part, reflects the high rate for upper respiratory infections, although there also is the possibility of provider-induced demand for services.

8) Overall higher utilization in the diagnosis and operation categories selected suggests that the district requires in depth epidemiological studies on morbidity, especially in relation to native residents.

5.4 Recommendations

The following recommendations are offered, based on the major findings of the study:

1) Analysis of the Wetaskiwin General Hospital's market share of district residents (relevance index) should be performed on an annual basis. These data can be supplied by the Department of Hospitals and Medical Care. These calculations are relatively easy to determine, requiring little time and expense for hospital administration. Annual calculations can provide timely information on changes in patient care-seeking patterns and assist administrators in planning.

2) Determinations of who uses the hospital (commitment index), separated into district of residence, also should be calculated annually. These data are available from hospital records. Annual analysis of these data would provide

timely information to administrators and the governing board on the extent of care the hospital is providing to local residents and non-residents.

3) Use of DRG (Diagnosis Related Groups) weighting or other measures may be useful to offset the effects of case-mix variations in computing the relevance and commitment indices.

4) Analyses of disease-specific and procedure-specific utilization could be conducted annually, but only for the most frequently occurring codes. For categories which do not occur frequently, calculations can be performed on a moving average basis.

5) The use of the city and county as the unit of geographical area, instead of the general hospital district, would simplify calculations and permit utilization rates to be determined annually. Population estimates for city and county residents are available from the municipal governments and the Alberta Bureau of Statistics, and for districts such as Wetaskiwin, annual population estimates for native populations can be obtained from Health and Welfare Canada.

6) Research studies covering a similar time-span as this study could be undertaken in other rural areas to determine if trends observed for Wetaskiwin are unique to this particular hospital district or whether they are typical of most rural hospital districts. If a sufficient number of studies are completed, it may be possible to develop a model of rural hospital utilization that would be of value to rural administrators.

7) A major epidemiological study using linked separation abstracts and including out-patient utilization, especially in relation to native residents, should be conducted to provide explanations for high district utilization rates.

8) A review of Wetoka Health Unit (Wetaskiwin) service levels in relation to other health units may assist in determining why Wetaskiwin residents consistently have above average utilization rates.

LITERATURE CITED

Acton, J.P. (1975). Nonmonetary factors in the demand for medical services: Some empirical evidence. Journal of Political Economy, 83, 595-614.

Aday, L.A. (1975). Economic and noneconomic barriers to the use of needed medical services. Medical Care, 13(16), 447-456.

Alberta Hospital Utilization Committee (AHUC). (1981). Hospital utilization, a report to the Minister of Hospitals and Medical Care. Edmonton: Author.

Allen, S. (1986). Utilization of acute care hospital services by psychiatric patients in Alberta. Unpublished master's thesis, Department of Health Services Administration and Community Medicine, University of Alberta.

Andersen, R., & Aday, L.A. (1978). Access to medical care in the U.S.: realized and potential. Medical Care, 14(7), 533-546.

Andersen, R., & Newman, J.F. (1973). Societal and individual determinants of medical care utilization in the United States. Milbank Memorial Fund Quarterly, 51(1), 95-124.

Anderson, J.G. (1972). Causal model of health service systems. Health Services Research, 7(1), 23-47.

Anderson, J.G. (1973). Demographic factors affecting health services utilization: a causal model. Medical Care, 11(2), 104-120.

Anderson, J.G. (1976). A social systems model of hospital utilization. Health Services Research, 11(3), 271-287.

Anderson, O.W. (1963). The utilization of health services. In: H.E. Freeman, S. Levine, and L.G. Reeder, (Eds.), Handbook of Medical Sociology, (pp. 349-367). New Jersey: Prentice-Hall.

Anderson, O.W., & Andersen, R.M. (1972). Patterns of use of health services. In: H.E. Freeman, S. Levine, and L.G. Reeder (Eds.), Handbook of Medical Sociology, (pp. 387-406). 2nd Edition. New Jersey: Prentice-Hall.

Barnes, B.A. (1982). Population-based small-unit analysis of health care. In: D.L. Rothberg (Ed.), Regional Variations in Hospital Use, (pp. 187-203). Toronto: Lexington Books.

Bashur, R.L., Shannon, G.W., & Metzner, C.A. (1971). Some ecological differentials in the use of medical services. Health Services Research, 6(1), 61-75.

Basu, R. (1982). Use of emergency room facilities in a rural area: A spatial analysis. Social Science & Medicine, 16, 75-84.

Battista, R.N., Spasoff, R.A., & Sptizer, W.O. (1986). Choice of technique: patterns of medical practices. In: R.G. Evans, & G.L. Stoddart (Eds.), Medicare at Maturity, (pp. 181-213). Calgary: The University of Calgary Press.

Bay, K.S., & Nestman, L.J. (1980). A hospital service population model and its application. International Journal of Health Services, 10(4), 677-695.

Bay, K.S., & Nestman, L.J. (1984). The use of bed distribution and service population indexes for hospital bed allocation. Health Services Research, 19(2), 141-160.

Beck, R.G., & Horne, J.M. (1981). Fee-for-service versus prepaid group practice and longitudinal effects in utilization. Medical Care, 19(7), 758-765.

Becker, M.H., Haefner, D.P., Kasl, S.V., Kirscht, J.P., Maiman, L.A., & Rosenstock, I.M. (1977). Selected psychosocial models and correlates of individual health-related behaviors. Medical Care, 15(5)(Suppl.), 27-46.

Bergner, M., & Rothman, M.L. (1987). Health status measures: an overview and guide for selection. Annual Review of Public Health, 8, 191-210.

Berkanovic, E., Telesky, C., & Reeder, S. (1981). Structural and social psychological factors in the decision to seek medical care for symptoms. Medical Care, 19(7), 696-709.

Bice, T.W., & White, K.L. (1971). Cross-national comparative research on the utilization of medical services. Medical Care, 9(3), 253-271.

Blumberg, M.S. (1982). Regional differences in hospital use standardized by reported morbidity. Medical Care, 20(9), 931-945.

Blumberg, M.S. (1984). At risk for hospitalization: differences by health insurance coverage and income. Advances in Health Economics and Health Services Research, 5, 277-309.

Blumberg, M.S. (1987). Inter-area variations in age-adjusted health status. Medical Care, 25(4), 340-353.

Bognanni, S., & Phillips, K. (1982). Reducing hospital use in Iowa: A conceptual model. Inquiry, 19, 336-345.

Bombardier, C., Fuchs, V.R., Lilliard, L.A., & Warner, K.E. (1977). Socioeconomic factors affecting the utilization of surgical operations. New England Journal of Medicine, 297(13), 699-705.

Bosanac, E.M., Parkinson, R.C., & Hall, D.S. (1976). Geographic access to hospital care: A 30-minute travel time standard. Medical Care, 14(7), 616-624.

Boulding, K.E. (1966). The concept of need for health services. Milbank Memorial Fund Quarterly, 44(Suppl.), 202-221.

Branch, L., Jette, A., Evashwick, C., Polansky, M., Rowe, G., & Diehr, P. (1981). Toward understanding elders' health service utilization. Journal of Community Health, 7(2), 80-92.

Brewer, W.R., & Freedman, M.A. (1982). Causes and implications of variation in hospital utilization. Journal of Public Health Policy, 3(4), 445-454.

Bunker, J.P. & Brown, B.W. (1974). The physician-patient as an informed consumer of surgical services. New England Journal of Medicine, 290(19), 1051-1055.

Carpenter, E.S. & Plessas. (1985). Estimating hospital service areas using mortality statistics. Health Services Research, 20(1), 19-26.

Chen, M.K. (1979). Measuring need for health services. A proposed model. Medical Care, 17(2), 210-214.

Chiswick, B.R. (1976). Hospital utilization: an analysis of SMSA differences in occupancy rates, admission rates, and bed rates. Explorations in Economic Research, 3, 326-378.

Ciocco, A., & Altenderfer, M.E. (1945). Birth statistics as an index of interdependence of counties with regard to medical services. Public Health Reports, 60(34), 973-985.

Cohen, M.A., & Lee, H.L. (1985). The determinants of spatial distribution of hospital utilization in a region. Medical Care, 23(1), 27-38.

Connell, F.A., Blide, L.A., & Hanken, M.A. (1984). Clinical correlates of small area variations in population-based admission rates for diabetes. Medical Care, 22(10), 939-950.

Connell, F.A., Day, R.W., & LoGerfo, J.P. (1981). Hospitalization of medicaid children: analysis of small area variations in admission rates. American Journal of Public Health, 71(6), 606-613.

Connell, F.A., Diehr, P., & Hart, L.G. (1987). The use of large data bases in health care studies. Annual Review of Public Health, 8, 51-74.

Connop, P.J. (1983). A Canadian Indian health status index. Medical Care, 21(1), 67-81.

Cooper, R. (1986). The biological concept of race and its application to public health and epidemiology. Journal of Health Politics, Policy and Law, 11(1), 97-116.

Davis, K., & Marshall, R. (1979). New developments in the market for rural health care. Research in Health Economics, 1, 57-110.

Detmer, D.E. & Tyson, T.J. (1978). Regional differences in surgical care based upon uniform physician and hospital discharge abstract data. Annals of Surgery, 187(2), 166-169.

Donabedian, A. (1973). Aspects of Medical Care Administration: Specifying Requirements for Health Care. Cambridge: Harvard University Press.

Drosness, D.L., & Lubin, J.W. (1966). Planning can be based on patient travel. Modern Hospital, 106(4), 92-94.

Drosness, D.L., Reed, I.M., & Lubin, J.W. (1965). The application of computer graphics to patient origin study techniques. Public Health Reports, 80(1), 33-40.

Dyck, F.J. Murphy, F.A., Murphy, J.K., Road, D.A., Boyd, M.S., Osborne, E., de Vlieger, D. Korchinski, B., Ripoley, C., Bromley, A.T., & Innes, P.B. (1977). Effect of surveillance on the number of hysterectomies in the Province of Saskatchewan. New England Journal of Medicine, 296(23), 1326-1328.

Elinson, J. (1977). Insensitive health statistics and the dilemma of HSAs. American Journal of Public Health, 67(5), 417-418.

Evans, R.G. (1984). Strained Mercy: The Economics of Canadian Health Care. Toronto: Butterworth & Co.

Evans, R.G. (1986). Finding the levers, finding the courage: lessons from cost containment in North America. Journal of Health Politics, Policy and Law, 11(4), 585-615.

Feldstein, P.J. (1966). Research on the demand for health services. Milbank Memorial Fund Quarterly, 44(Suppl.), 128-165.

Fiedler, J.L. (1981). A review of the literature on access and utilization of medical care with special emphasis on rural primary care. Social Science & Medicine, 15C, 129-142.

Garnick, D.W., Luft, H.S., Robinson, J.C., & Tetreault, J. (1987). Appropriate measures of hospital market areas. Health Services Research, 22(1), 69-89.

Geertsen, R., Klauber, M.R., Rindflesh, M., Kane, R.L., & Gray, R. (1975). A re-examination of Suchman's views on social factors in health care utilization. Journal of Health and Social Behavior, 16(2), 226-237.

Goldfarb, M.G., Hornbrook, M.C., & Higgins, C.S. (1983). Determinants of hospital use: a cross-diagnostic analysis. Medical Care, 21, 48-66.

Gordon, P.C., Weldon, K.L.M., & MacLean, L. (1974). Trends in hospital utilization in Nova Scotia. Nova Scotia Medical Bulletin, 53, 47-54.

Gornick, M. (1982). Trends and regional variations in hospital use under medicare. In: D.L. Rothberg (Ed.), Regional Variations in Hospital Use, (pp. 131-184). Toronto: Lexington Books.

Greene, S.B., Salber, E.J., & Feldman, J.J. (1978). Distribution of illnesses and its implications in a rural community. Medical Care, 16(10), 863-877.

Griffith, J.R. (1968). Whom does your hospital serve? Hospital Administration, 13(2), 69-73.

Griffith, J.R. (1972). Quantitative Techniques for Hospital Planning and Control. Toronto: Lexington Books.

Griffith, J.R. (1976). Measuring service areas and forecasting demand. In: J.R. Griffith, W.M. Hancock and F.C. Munson (Eds.) Cost Control in Hospitals, (pp. 36-69). Ann Arbor, Michigan: Health Administration Press.

Griffith, J.R. (1978). A proposal for new hospital performance measures. Hospital and Health Services Administration, (Spring), 60-84.

Griffith, J.R., Restuccia, J.D., Tedeschi, P.J., Wilson, P.A., & Zuckerman, H.S. (1981). Measuring community hospital services in Michigan. Health Services Research, 16(2), 135-173.

Griffith, J.R., & Wellman, B.T. (1979). Forecasting bed needs and recommending facilities plans for community hospitals. A review of past performance. Medical Care, 17(3), 293-303.

Harris, D.M. (1975a). An elaboration of the relationship between general hospital bed supply and general hospital utilization. Journal of Health and Social Behavior, 16(2), 163-172.

Harris, D.M. (1975b). Effect of population and health care environment on hospital utilization. Health Services Research, 10(3), 229-243.

Hassinger, E.W. (1976). Pathways of rural people to health services. In: E.W. Hassinger and L.R. Whiting (Eds.). Rural Health Services: Organization, Delivery and Use, (pp. 164-187). Ames, Iowa: Iowa State University Press.

Hassinger, E., & Hobbs, D. (1973). The relation of community context to utilization of health service in a rural area. Medical Care, 11(6), 509-522.

Hershey, J.C., Luft, H.S., & Gianaris, J.M. (1975). Making sense out of utilization data. Medical Care, 13(10), 838-854.

Horne, J.M., & Beck, R.G. (1978). Temporal patterns in the use of health services leading to cholecystectomy. A process evaluation using insurance records. Medical Care, 16(12), 1006-1018.

Hulka, B.S., & Wheat, J.R. (1985). Patterns of Utilization. The patient perspective. Medical Care, 23(5), 438-460.

Ingram, D.R., Clarke, D.R., & Murdie, R.A. (1978). Distance and the decision to visit an emergency department. Social Science and Medicine, 12D, 55-62.

Jarvis, G.K., & Boldt, M. (1982). Death styles among Canada's Indians. Social Science & Medicine, 16, 1345-1352.

Jeffers, J.R., Bognanno, M.F., & Bartlett, J.C. (1971). On the demand versus need for medical services and the concept of "shortage". American Journal of Public Health, 61(1), 46-63.

Joseph, A.E. (1979). The referral system as a modifier of distance decay effects in the utilization of mental health care services. Canadian Geographer, 23, 159-169.

Joseph, A.E. & Bantock, P.R. (1982). Measuring potential physical accessibility to general practitioners in rural areas: a method and case study. Social Science and Medicine, 16, 85-90.

Joskow, P.L. (1980). The effects of competition and regulation on hospital bed supply and the reservation quality of the hospital. Bell Journal of Economics, 11, 421-447.

Kalimo, E. (1979a). Health service needs. In: W.W. Holland, J. Ipsen, and J. Kostrzewski, (Eds.). Measurement of Levels of Health, (pp. 64-72). Copenhagen: World Health Organization.

Kalimo, E. (1979b). A method for estimating the need for care. In: W.W. Holland, J. Ipsen, and J. Kostrzewski, (Eds.). Measurement of Levels of Health, (pp. 313-320). Copenhagen: World Health Organization.

Kane, R.L. (1969). Determination of health care priorities and expectations among rural consumers. Health Services Research, 4(2), 142-151.

Kane, R., Dean, M., & Solomon, M. (1979). An evaluation of rural health care research. Evaluation Quarterly, 3(2), 139-189.

Kane, R., Olsen, D., Wright, D., Kasteller, J., & Swoboda, J. (1978). Changes in utilization patterns in a National Health Service Corps community. Medical Care, 16(10), 828-836.

Kennedy, V.C. (1980). Locational aspects of medical care-seeking in a rural population, with some implications for public policy research. Journal of Health Politics, Policy and Law, 5(1), 142-151.

Khan, A.A. (1986). Two simple methods of spatial analysis and their applications in location-oriented health services research. American Journal of Public Health, 76(10), 1207-1209.

Kleinman, J.C., & Wilson, R.W. (1977). Are "medically underserved areas" medically underserved? Health Services Research, 12, 147-162.

Knickman, J.R., & Foltz, A-M. (1985). A statistical analysis of reasons for east-west differences in hospital use. Inquiry, 22, 45-58.

Koutsopoulos, K.C., Meyer, R.J., & Henley, D. (1977). Psychometric modelling of consumer decisions in primary health care. Health Services Research, 12, 427-437.

Lagoe, R.J. (1986). Differences in hospital discharge rates. A community-based analysis. Medical Care, 24(9), 868-872.

Langelle, P. (1987). Wetaskiwin physicians manage bed allocations. Dimensions, 64(1), 28-30.

Last, J.M. (1982). Health of native Canadians - its relevance to world health. Canadian Journal of Public Health 73(5), 297-298.

Lembcke, P.A. (1952). Measuring the quality of medical care through vital statistics based on hospital service areas: 1. Comparative study of appendectomy rates. American Journal of Public Health, 42, 276-286.

Luft, H.S., Bunker, J.P, & Enthoven, P. (1979). Should operations be regionalized? The empirical relation between surgical volume and mortality. New England Journal of Medicine, 301(25), 1364-1369.

Luft, H.S., Robinson, J.C., Garnick, D.W., Maerki, S.C., & McPhee, S.J. (1986). The role of specialized clinical services in competition among hospitals. Inquiry, 23, 83-94.

MacDonald, P.J. (1983). Utilization of surgical services in Alberta. Unpublished master's thesis, Department of Health Services Administration and Community Medicine, University of Alberta.

MacLean, L.C., & Weldon, K.L. (1977). Self-sufficiency in a regional hospital system. Health Services Research, 12(3), 312-321.

Maher, M.C. (1987). Utilization of acute care hospital services by cardiovascular patients in Alberta. Unpublished master's thesis, Department of Health Services Administration and Community Medicine, University of Alberta.

Makuc, D., Kleinman, J.C., & Pierre, M.B. (1985). Service areas for ambulatory medical care. Health Services Research, 20(1), 1-18.

Manga, P., Broyles, R.W., & Angus, D.E. (1987). The determinants of hospital utilization under a universal public insurance program in Canada. Medical Care, 25(7), 658-670.

Mao, Y., Morrison, H., Semenciw, R., & Wigle, D. (1986). Mortality on Canadian Indian reserves 1977-1982. Canadian Journal of Public Health, 77, 263-268.

Marmot, M.G., Kogevinas, M., & Elston, M.A. (1987). Social/economic status and disease. Annual Review of Public Health, 8, 111-135.

Marrinson, R. (1964). Hospital service area: time replaces space. Hospitals, 38(Jan. 16), 52-54.

Mason, W.B., Bedwell, C.L., Vander Zwaag, R., & Runyan, J.W. (1980). Why people are hospitalized. A description of preventable factors leading to admission for medical illness. Medical Care, 18(2), 147-163.

May, J.J. (1975). Utilization of health services and the availability of resources. In: R. Andersen, J. Kravits, & O.W. Anderson (Eds.), Equity in Health Services: Empirical Analyses in Social Policy, (pp. 131-149). Cambridge: Ballinger Publishing Co.

McClure, W. (1982). Toward development and application of a qualitative theory of hospital utilization. Inquiry, 19, 117-135.

McGuirk, M.A., & Porell, F.W. (1984). Spatial patterns of hospital utilization: The impact of distance and time. Inquiry, 21, 84-95.

McKinlay, J.B. (1972). Some approaches and problems in the study of the use of services - an overview. Journal of Health and Social Behavior, 13, 115-152.

McPherson, K., Wennberg, J.E., Hovind, D.B., & Clifford, P. (1982). Small area variations in the use of common surgical procedures: an international comparison of New England, England, and Norway. New England Journal of Medicine, 307(21), 1310-1314.

Meade, J. (1974). A mathematical model for deriving hospital service areas. International Journal of Health Services, 4(2), 353-364.

Meade, J.M. (1976). Validity of repeating patient origin studies for rural hospitals. Public Health Reports, 91(1), 62-66.

Miners, L.A., Greene, S.B., Salber, E.J., & Scheffler, R.M. (1978). Demand for medical care in a rural setting: Racial comparisons. Health Services Research, 13(3), 261-275.

Mitchell J.B. & Cromwell, J. (1982). Variations in surgery rates and the supply of surgeons. In: D.L. Rothberg (Ed.), Regional Variations in Hospital Use, (pp. 103-129). Toronto: Lexington Books.

Morrill, R.L., & Earickson, R. (1968). Variation in the character and use of Chicago area hospitals. Health Services Research, 3(3), 224-238.

Morrill, R.L., & Earickson, R. (1969). Locational efficiency of Chicago hospitals: an experimental model. Health Services Research, 4, 128-141.

Morrison, H.I., Semenciw, R.M., Mao, Y., & Wigle, D.T. (1986). Infant mortality on Canadian Indian reserves 1976-1983. Canadian Journal of Public Health, 77, 269-273.

Nagi, S.Z., & Marsh, J. (1980). Disability, health status, and utilization of health services. International Journal of Health Services, 10(4), 657-676.

Nathanson, C.A. (1977). Sex, illness, and medical care. A review of data, theory, and method. Social Science & Medicine, 11, 13-25.

Northcott, H.C., & Rall, R.W. (1983). Factors in the utilization of the small non-metropolitan hospital in Alberta, Canada. Social Science & Medicine, 17(18), 1379-1387.

Nuttall, R.N. (1982). The development of Indian boards of health in Alberta. Canadian Journal of Public Health, 73, 300-309.

Ohmura, J. (1978). Analysis of factors affecting the need and demand for medical care. Social Science & Medicine, 12A, 485-496.

Paine, D.W., & Wilson, L.L. (1975). The determination of acute care bed requirements for provincial acute care hospital regions. In: N.T.J. Bailey and M. Thompson (Eds.), Systems Aspects of Health Planning, (pp. 63-76). Amsterdam: North-Holland Publishing Co.

Postl, B. (1986). Native health - a continuing concern. Canadian Journal of Public Health, 77, 253-254.

Raasok, S.M. (1979). Nursing home bed utilization in Alberta: A patient origin-destination study. Unpublished master's thesis, Division of Health Services Administration, University of Alberta.

Rice, T. (1984). Physician-induced demand for medical care: new evidence from the medicare program. Advances in Health Economics and Health Services Research, 5, 129-160.

Richardson, J.D., & Scutchfield, F.D. (1973). Priorities in health care: The consumer's viewpoint in an Appalachian community. American Journal of Public Health, 63(1), 79-82.

Roemer, M.I. (1961). Bed supply and utilization: A natural experiment. Hospitals, 35, 35-42.

Romeril, C. (1984). Utilization of acute care hospital pediatric services in Alberta. Unpublished master's thesis, Department of Health Services Administration and Community Medicine, University of Alberta.

Roos, N.P. (1984). Hysterectomy: variations in rates across small areas and across physicians' practices. American Journal of Public Health, 74(4), 327-335.

Roos, N.P., Flowerdew, G., Wajda, A., & Tate, R.B. (1986). Variations in physicians' hospitalization practices: A population-based study in Manitoba, Canada. American Journal of Public Health, 76(1), 45-51.

Roos, N.P., & Roos, L.L. (1981). High and low surgical rates: risk factors for area residents. American Journal of Public Health, 71(6), 591-600.

Roos, N.P., & Roos, L.L. (1982). Surgical rate variations: Do they reflect the health or socioeconomic characteristics of the population? Medical Care, 20(9), 945-958.

Roos, N.P., Roos, L.L., & Henteleff, P.D. (1977). Elective surgical rates - do high rates mean lower standards? Tonsillectomy and adenoidectomy in Manitoba. New England Journal of Medicine, 297(7), 360-365.

Roos, N.P. & Shapiro, E. (1981). The Manitoba longitudinal study on ageing. Medical Care, 19(6), 644-657.

Roos, N.P., Shapiro, E., & Roos, L.L. (1984). Aging and the demand for health services: which aged and whose demand. The Gerontologist, 24(1), 31-36.

Rothberg, D.L. (1982). Regional variations in hospital use: introduction and overview. In: D.L. Rothberg (Ed.), Regional Variations in Hospital Use, (pp. 1-20). Toronto: Lexington Books.

Rowley, B.D., & Baldwin, D.C. (1984). Assessing rural community resources for health care: The use of health services catchment area economic marketing studies. Social Science & Medicine, 18(6), 525-529.

Salber, E.J., Greene, S.B., Feldman, J.J., & Hunter, G. (1976). Access to health care in a southern rural community. Medical Care, 14(12), 971-986.

Schaefer, M.E. (1975). Demand versus need for medical services in a general cost-benefit setting. American Journal of Public Health, 65(3), 293-295.

Shannon, G.W. (1977). Space, time and illness behavior. Social Science & Medicine, 11, 683-689.

Shannon, G.W., Bashur, R.L., & Metzner, C.A. (1969). The concept of distance as a factor in accessibility and utilization of health care. Medical Care Review, 26(2), 149-150.

Sharp, L.J., & McCarthy, W.T. (1971). Patient origin study. Northwest Medicine, 70(2), 838-841.

Shaughnessy, P.W. (1982). Methodological issues in per capita measurement in health care. Health Services Research, 17(1), 61-81.

Shonick, W. (1976). Elements of Planning for Area-wide Personal Health Services. St. Louis: The C.V. Mosby Co.

Shortell, S.M. (1980). Factors associated with the utilization of health services. In: S.J. Williams and P.R. Torens (Eds.), Introduction to Health Services, (pp. 48-90). Toronto: John Wiley and Sons.

Shy, K.K., Larson, E.B., & Luthy, D.A. (1987). Evaluating a new technology: The effectiveness of electronic fetal heart rate monitoring. American Review of Public Health, 8, 165-190.

Sievers, M.L., & Fisher, J.R. (1981). Diseases of North American Indians. In: H. Rothschild (Ed.). Biocultural Aspects of Disease (pp. 191-252). Toronto: Academic Press.

Sievers, M.L., & Fisher, J.R. (1983). Cancer in North American Indians: Environment versus heredity. American Journal of Public Health, 735, 485-486.

Sloan, F.A., & Valvona, F. (1986). Why has hospital length of stay declined? An evaluation of alternative theories. Social Science & Medicine, 22(1), 63-73.

Statistics Canada. 1971 Census of Canada. (Catalogue 92-715).

Statistics Canada. 1976 Census of Canada. (Catalogue 92-823).

Statistics Canada. 1981 Census of Canada. (Catalogue 92-901).

Statistics Canada. 1986 Census of Canada. (Catalogue 94-117).

Stockwell, H., & Vayda, E. (1979). Variations in surgery in Ontario. Medical Care, 17(4), 390-396.

Stuart, B., & Stockton, R. (1973). Control over the utilization of medical services. Milbank Memorial Fund Quarterly, 51, 341-394.

Studnicki, J. (1975a). The minimization of travel effort as a delineating influence for urban hospital service areas. International Journal of Health Services, 5(4), 679-693.

Studnicki, J. (1975b). The geographic fallacy: hospital planning and spatial behavior. Hospital Administration, 20(3), 10-21.

Szafran, O. (1985). Utilization of acute care hospitals by the elderly in Alberta. Unpublished master's thesis, Department of Health Services Administration and Community Medicine, University of Alberta.

Teixeira, C.A. (1975). A review of methods of estimating hospital service population. Unpublished major paper. Division of Health Services Administration, University of Alberta.

Thacker, S.B., Greene, S.B., & Salber, E.J. (1977). Hospitalizations in a southern rural community: An application of the 'Ecology Model'. International Journal of Epidemiology, 6(1), 55-63.

Toll, K.A. (1982). Hospital bed utilization by levels of care in Alberta. Unpublished master's thesis, Department of Health Services Administration and Community Medicine, University of Alberta.

van der Gaag, J., Rutten, F.F.H., & van Pragg, B.M.S. (1975). Determinants of hospital utilization in the Netherlands. Health Services Research, 10(3), 264-277.

Vayda, E., Mindell, W.R., & Rutkow, I.M. (1982). A decade of surgery in Canada, England and Wales, and the United States. Archives of Surgery, 117, 846-853.

Verbrugge, L.M., & Wingard, D.L. (1987). Sex differentials in health and mortality. Health Matrix, 5(2), 3-19.

Walker, L.L. (1976). Inpatient and emergency department utilization: the effect of distance, social class, age, sex, and marital status. Journal of the American College of Emergency Physicians, 5, 105-110.

Watts, E.S. (1981). The biological race concept and diseases of modern man. In: H. Rothschild (Ed.). Biocultural Aspects of Disease (pp. 3-23). Toronto: Academic Press.

Weil, T.P. (1981). Do more physicians generate more hospital utilization? Hospitals, 55(23), 70-74.

Weiss, J.E., Greenlick, M.R., & Jones, J.F. (1971). Determinants of medical care utilization: The impact of spatial factors. Inquiry, 8(4), 50-57.

Wennberg, J.E. (1979). Factors governing utilization of hospital services. Hospital Practice, 14(9), 115-121, 126-127.

Wennberg, J.E. (1985). On patient need, equity, supplier-induced demand, and the need to assess the outcome of common medical practices. Medical Care, 23(5), 512-520.

Wennberg, J.E. (1987). Population illness rates do not explain population hospitalization rates. Medical Care, 25(4), 354-359.

Wennberg, J.E., Bunker, J.P., & Barnes, B. (1980). The need for assessing the outcome of common medical practices. Annual Review of Public Health, 1, 277-295.

Wennberg, J. & Gittelsohn, A. (1973). Small area variations in health care delivery. Science, 182, 1102-1108.

Wennberg, J.E., & Gittelsohn, A. (1982). Variations in medical care among small areas. Scientific American, 246, 220-234.

White, K.L., Williams, T.F., & Greenberg, B.G. (1961). The ecology of medical care. New England Journal of Medicine, 265(18), 885-892.

White, K.L., Anderson, D.O., Bice, T.W., Kalimo, E., & Schach, E. (1976). Health care: An international comparison of perceived morbidity, health services resources, and use. International Journal of Health Services, 6(2), 199-218.

Wilder, R.P., & Jacobs, P. (1987). Antitrust considerations for hospital mergers: Market definition and market concentration. Advances in Health Economics and Health Services Research, 7, 245-262.

Wilson, G.W. & Jadlow, J.M. (1982). Competition, profit incentives, and technical efficiency in the provision of nuclear medicine services. Bell Journal of Economics, 13, 472-482.

Wilson, P.A., Griffith, J.R., & Tedeschi, P.J. (1985). Does race affect hospital use? American Journal of Public Health, 75(3), 263-269.

Wilson, P. & Tedeschi, P. (1984). Community correlates of hospital use. Health Services Research, 19(3), 333-355.

Wolinsky, F.D. (1976). Health service utilization and attitudes toward health maintenance organizations: A theoretical and methodological discussion. Journal of Health and Social Behavior, 17, 221-236.

Wolinsky, F.D. (1978). Assessing the effects of predisposing, enabling, and illness morbidity characteristics on health service utilization. Journal of Health and Social Behavior, 19, 384-396.

Woolhandler, S., Himmelstein, D.U., Silber, R., Bader, M., Harnly, M., & Jones, A.A. (1985). Medical care and mortality: racial differences in preventable deaths. International Journal of Health Services, 15(1), 1-22.

Wright, D.D. (1976). Recent rural health research. Journal of Community Health, 2, 60-72.

Wright, D.D., Kane, R.L., Kronhaus, A., Woolley, F.R., & Altman, D. (1982). Predicting rural health care utilization with archival data. Journal of Community Health, 7(4), 284-291.

Yelin, E.H., Kramer, J.S., & Epstein, W.V. (1983). Is health care use equivalent across social groups? A diagnosis-based study. American Journal of Public Health, 73(5), 563-571.

Yergan, J., Flood, A.B., LoGerfo, J.P., & Diehr, P. (1987). Relationship between patient race and the intensity of hospital services. Medical Care, 25(7), 592-603.

Young, D.G. & Alberta Utilization Committee. (1985). Utilization of Medical Services. Edmonton: Author.

Young, T.K. (1982). Self-perceived and clinically assessed health status of Indians in Northwestern Ontario: Analysis of a health survey. Canadian Journal of Public Health, 73, 272-277.

Zimmerman, J.P. (1975). Service areas and their needs must be reassessed. Hospitals, 49, 46-48.

Zuckerman, A.M. (1977). Patient origin study profiles service area, evolving patterns. Hospitals, 51, 83-85, 236.

APPENDIX A

CALCULATION OF POPULATION ESTIMATES

Population estimate data were derived from two sources: 1) Statistics Canada for the City and County of Wetaskiwin populations, and 2) Health and Welfare Canada for the Indian population. The Department of Hospitals and Medical Care (DHMC) contracts with Statistics Canada to manipulate these data to determine population estimates for five-year age and sex groups for general hospital districts in census years. Since the study is based on GHD 81 residents, it was determined that the estimates should reflect as best as possible the DHMC population estimates.

Population estimates were derived using a number of steps. The City and County of Wetaskiwin population estimates were summed with the annual estimates for Indians living on their own reserve, to achieve a combined estimate. This estimate was higher than the DHMC estimate for each of the years for which comparable data were available. In order to reflect the DHMC population estimate, the final estimates for the census years (1971, 1976, 1981) were taken to be the DHMC estimate. For intercensal years the final estimate was derived by pro-rating the DHMC estimate with the combined estimate. It was calculated by multiplying the percentage increase in the combined estimate from one year to the next by the previous year's initial estimate. Added to this number was a constant, multiplied by the number of intercensal years between the year in question and the base year. The addition of the constant allowed the initial estimate to equal the final DHMC estimate in census years. The following formula was used:

$$FE = (P_1 * P_2 / P_3) + (C * n)$$

where: RFE = Final population estimate
P_1 = Previous year's initial estimate (DHMC)
P_2 = Combined estimate for current year
P_3 = Combined estimate for previous year
n = number of intercensal years
C = constant $(D_2 - D_1 / 5)$ where
D_2 = Final DHMC estimate for next census year
D_1 = Initial estimate for next census year

Since DHMC estimates were unavailable for the 1986 census year, intercensal year estimates after 1981 were derived by multiplying the ratio of the DHMC estimate to the combined estimate for 1981, with the combined estimates for subsequent years.